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Robert Walpole
Licensing Manager

NL-14-039

April 28, 2014

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: 2013 Annual Radioactive Effluent Release Report
Indian Point Unit Nos. 1, 2 and 3
Docket Nos. 50-03, 50-247, 50-286
License Nos. DPR-5, DPR-26, DPR-64

Dear Sir or Madam:

Enclosure 1 to this letter provides Entergy Nuclear Operations, Inc.'s Annual Radioactive Effluent Release Report for 2013. This report is submitted in accordance with Technical Specification 5.6.3 and Regulatory Guide 1.21.

There are no new commitments contained in this letter. If you have any questions or require additional information, please contact me.

Sincerely,

RW/ai

cc: next page

FSME20
IE48
NRR
FSME

Enclosure: 1. Radioactive Effluent Release Report: 2013

cc: Mr. William Dean, Regional Administrator, NRC Region 1
Mr. Douglas Pickett, Senior Project Manager, NRC NRR DORL
IPEC NRC Resident Inspector's Office
Mr. Stephen Giebel, IPEC NRC Unit 1 Project Manager
Mr. John B. Rhodes, President and CEO, NYSERDA (w/o enclosure)
Ms. Bridget Frymire, New York State Department of Public Service (w/o enclosure)
Mr. Timothy Rice, Bureau of Hazardous Waste & Radiation Mgmt, NYSDEC
Mr. Robert Snyder, NYS Department of Health
Mr. Chuck Nieder, NYS Department of Environmental Conservation
Mr. Jason Martinez, American Nuclear Insurers
Chief, Compliance Section, New York State DEC,
Division of Water Regional Water Engineer, New York State DEC

ENCLOSURE 1 TO NL-14-039

Radioactive Effluent Release Report: 2013

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT UNIT 1, 2, and 3 NUCLEAR POWER PLANTS
DOCKET Nos. 50-03, 50-247, and 50-286

Radioactive Effluent Release Report: 2013

Facility Indian Point Energy Center (Indian Point Units 1, 2, and 3)

Licensee Entergy Nuclear Operations, Inc (Entergy)

This information is provided in accordance with the requirements of Regulatory Guide 1.21. The numbered sections of this report reference corresponding sections of the subject Guide, pages 10 to 12. This report includes effluent information from Indian Point Units 1, 2, and 3. Units 1 and 2 share effluent processing equipment and Technical Specifications. In this site report, releases from Unit 1 are included with Unit 2, while Unit 3 releases are calculated and shown separately.

A. Supplemental Information

1. Regulatory Limits

Indian Point Energy Center is subject to limits on radioactive waste releases that are set forth in the Offsite Dose Calculation Manual (ODCM), Parts I and II, as defined in the Technical Specifications. ODCM Part I, also known as the Radiological Effluent Controls (or RECS) contains the specific requirements and controls, while ODCM Part II (calculational methodologies) contains the details necessary to perform offsite dose calculations from the sampling and monitoring outlined in the RECS.

2. Maximum Permissible Concentration

a) Airborne Releases

Maximum concentrations and compliance with 10CFR20 release rate limits are controlled by the application of Radiation Monitor setpoints, preliminary grab sampling, and conservative procedural guidance for batch and continuous releases. These measures, in conjunction with plant design, preclude approaching release rate limits, per the ODCM.

b) Liquid Effluents

Proximity to release rate and total release limits is controlled through the application of a calculated Allowed Diluted Concentration (ADC) and ALARA guidance with regard to dilution flow and maximum tank concentration. The ADC is used to determine a Radiation Monitor setpoint associated with an estimated amount of non-gamma activity (H-3, Ni-63, Fe-55, Sr-89/90 etc), as well as the measured gamma activity. ADC is defined in the station ODCM as a means of assuring compliance with the release rate limits of 10CFR20, as defined by the application of ten times the Effluent Concentrations of the new 10CFR20.

Liquid effluents are further controlled by the application of proceduralized ALARA limits such as a MINIMUM dilution flow of 100,000 gpm required for batch discharges, a maximum gamma concentration of 5E-5 uCi/ml (without gas) for routine effluents, and procedural guidance for optimizing decay and treatment of liquid waste.

3. Average Energy

This information is no longer used. It is available on site.

4. Measurements and Approximations of Total Radioactivity

a) Fission and Activation Gases

Analyses of effluent gases are performed in compliance with the requirements of the RECS (ODCM Part I). In the case of isolated tanks (batch releases), the total activity discharged is based on an isotopic analysis of each batch with the volume of gas in the batch corrected to standard temperature and pressure.

Vapor containment purge and pressure relief (vent) discharges, which routinely total less than 150 hours/quarter in duration, have been treated as batch releases. However, both types of releases from the Vapor Containment are performed randomly with regard to time of day and duration (release periods were not dependent solely on time of day or atmospheric condition). Therefore, determination of doses due to Vapor Containment releases includes the use of annual average dispersion data, as defined in NUREG 0133, Section 3.3.

At least one complete isotopic concentration analysis of containment air is performed monthly and compared to a process monitor's reading. Pressure reliefs are quantified by scaling subsequent releases with the monitor's reading, applying the mixture from the grab sample. In this fashion, the base grab sample defines the mixture and the activity released. The monitor scales the release up or down and provides continuous indication of potential leaks.

Isotopic analyses for each vapor containment purge are taken prior to and during the purge. This information is combined with the volume of air in each discharge to calculate the quantity of activity released from these discharges.

The continuous building discharges are based on weekly samples of ventilation air analyzed for isotopic content. This information is combined with total air volume discharged and the process radiation monitor readings to determine the quantity of activity from continuous discharges.

b/c) Iodines and Particulates

Iodine and particulate releases are quantified by collecting a continuous sample of ventilation air on a Triethylenediamine (TEDA) impregnated, activated charcoal cartridge and a glass-fiber filter paper. These samples are changed weekly as required in the RECS. The concentration of isotopes found by analysis of these samples is combined with the volume of air discharged during the sampling period to calculate the quantity of activity discharged.

If no I-131 is identified in weekly vent samples, "-" is entered in Table 1A. A typical Minimum Detectable Activity (MDA) for weekly I-131 analyses is 1.0E-13 uCi/cc, which is 100 times lower than ODCM requirements.

If I-131 is identified in any routine weekly sample, it is added to the table and other iodine isotopic concentrations (I-133, I-135) are then determined on a 24-hour sample at least once per month. The concentration of each isotope is analytically determined by ratioing the activities with weekly media for I-131. This activity is combined with the volume of air discharged during the sampling period to calculate the quantity of activity discharged. A compositing method of analyzing for gross alpha, Sr-89, and Sr-90 is used per the station ODCMs. An absence of any positive activity is identified as "-".

d) Carbon-14

C-14 release quantification details are discussed in Section E.

e) Liquid Effluents

A sample of each batch discharge is taken and an isotopic analysis is performed in compliance with requirements specified in the ODCM. Proportional composite samples of continuous discharges are taken and analyzed per the ODCM, as well. Isotopic concentration data are combined with the information on volume discharged to determine the amount of each isotope discharged.

A compositing method of analyzing for non-gamma emitters is used per the station ODCM (Gross Alpha, Sr-89, Sr-90, Fe-55 and Ni-63). When there has been no positive activity, "-" is entered.

Liquid Effluent volumes of waste released on Table 2A are differentiated between processed fluids (routine liquid waste and Unit 1's North Curtain Drain), and water discharged through monitored pathways identified in the ODCM, but NOT processed (SG Blowdown and Unit 1's Sphere Foundation Drain Sump). The unprocessed water may still contain trace levels of contamination (generally only tritium) and as such, is identified as liquid waste. Curie and dose data from unprocessed fluid is included in the following tables, along with all other liquid effluent, continuous or batch, processed or not. Processed and unprocessed water is differentiated only to prevent confusion with regard to measures undertaken to convert liquid to solid waste (resin cleanup). Therefore, volumes of processed and unprocessed liquid waste are reported separately on Table 2A.

5. Batch Releases

Airborne:

Unit 1 and 2 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2013
Number of Batch Releases		73	63	68	65	269
Total Time Period	(min)	3830	3210	3290	3790	14100
Maximum Time Period	(min)	89	89	107	121	121
Average Time Period	(min)	52.5	51.0	48.4	58.3	52.5
Minimum Time Period	(min)	25	1	2	2	1

Unit 3 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2013
Number of Batch Releases		37	29	19	16	101
Total Time Period	(min)	3210	2440	1980	1910	9550
Maximum Time Period	(min)	316	204	241	203	316
Average Time Period	(min)	86.9	84.2	104	119	94.5
Minimum Time Period	(min)	4	1	1	4	1

Liquid:

Unit 1 and 2 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2013
Number of Batch Releases		13	8	12	22	55
Total Time Period	(min)	1410	822	1200	2310	5750
Maximum Time Period	(min)	178	118	119	125	178
Average Time Period	(min)	108	103	100	105	105
Minimum Time Period	(min)	90	87	77	87	77

Unit 3 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2013
Number of Batch Releases		63	35	9	19	126
Total Time Period	(min)	7000	3900	944	2060	13900
Maximum Time Period	(min)	223	122	116	114	223
Average Time Period	(min)	111	112	105	109	110
Minimum Time Period	(min)	68	103	96	102	68

Average Stream Flow :

Regulatory Guide 1.21 includes a section to report average stream flows. This data, for some plants, is used to determine dilution volume. However, at IPEC, the Hudson River stream flow is not applied to dilution calculations, in favor of the more conservative method of using only the dilution in the discharge canal, running north to south, parallel to the river, and servicing the plant.

This conservative dilution volume is determined quarterly, applied for liquid offsite dose calculations (and all other determinations of diluted effluent), and reported on Tables 2A, in Section B of this report.

Hudson River flow information remains available, however, from the Department of the Interior, United States Geological Survey (USGS), or from web sites such as:

http://ny.water.usgs.gov/projects/dialer_plots/Hudson_R_at_Poughkeepsie_Freshwater_Discharge.htm

6. Abnormal Releases

a) Liquid

General Groundwater

IPEC's groundwater quantification model involves a verification/calibration such that the annual release to the environment remains a function of annual precipitation and source term. The 2013 effluent dose was similar to that of 2012.

The offsite dose associated with the groundwater pathway remains small (<0.01% of the NRC's annual limit), with routine liquid effluent contributing <0.1% of the annual limit. Groundwater and storm water effluent flow rates and source term data are further described in Section H of this report. A breakdown of the total dose from the groundwater and storm water pathways is provided in Section E of this report (Radiological Impact on Man).

b) Airborne

None

7. ODCM Reporting Requirements

ODCM Part I requires reporting of various conditions during the year. These include effluent monitoring equipment out of service for periods exceeding 30 consecutive days, notification of any changes in the land use census, changes in the Radiological Environmental Monitoring Program (REMP), any time total curie content limitations in outdoor tanks is exceeded, or any other changes in the ODCM or Process Control Program (PCP).

During this reporting period, the following ODCM required effluent monitoring equipment was out of service (OOS) for periods greater than 30 consecutive days:

Instrument	Effected Interval	Details
Unit 3 Condenser Off-gas Monitor, R-15	June 24 to Aug 30 66 days	Troubleshooting revealed a faulty detector. The detector was replaced and calibrated. The long outage was due to a complicated trouble shooting plan and emergent plant issues that received higher priority.
Unit 3 Admin Bldg Vent Monitor, R-46	July 16 to Oct 4 79 days	Rate-meter failed and needed to be replaced. The repair delayed due to obsolete parts. Original parts that were procured also failed. Both rate-meter drawers needed to be sent to vendor for refurbishment.
Unit 2 S/G & Service Water Monitors R-49, R-46, & R-53	Sep 11 to Dec 31 79 days	Eight pinhole leaks were discovered on the Unit 2 Radiation Monitoring System piping in the Service Water pipe chase. Affected piping was isolated for repair. Since the piping was isolated, RMs 49, 46 and 53 were declared non-functional. Initial piping repairs were completed in March during the 2014 refuel outage; additional repairs were noted and are still underway.

Unit 1 Sphere Foundation Drain Monitor, R-62	Oct 7 to Nov 22 45 days	Although RM was declared OOS, this pathway was diverted to the North Curtain Drain. Therefore, this is not a radioactive effluent issue since this pathway was not used during the OOS time.
Unit 2 Condenser Off-gas Monitor, R-45	Oct 18 to Dec 31 73 days	The vendor was brought in to repair the instrumentation. Several attempts to repair this instrument were unsuccessful. The entire monitor detection circuit was replaced, including the power supplies. The detector was replaced and recalibrated. The long outage was due the difficulty of diagnosis and repair and the fact that the failure appeared to be intermittent.

Other Reporting Criteria:

Tank Curie Limits

During this reporting period, no tank curie limits in outdoor tanks were exceeded.

Land Use Census

During this reporting period, there were no changes to the Land Use Census.

PCP changes:

The Process Control Program document is a fleet procedure for Entergy. An administrative update to this procedure was completed in 2013. See details in Section G.

ODCM changes:

During this reporting period, there were no changes to the ODCM.

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT RELEASE REPORT

B. GASEOUS EFFLUENTS

2013

TABLE 1A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013	Est. Total % Error
1. Total Release	Ci	1.78E-01	3.98E-02	1.67E-01	9.73E-02	4.82E-01	± 25
2. Average release rate	uCi/sec	2.29E-02	5.06E-03	2.10E-02	1.22E-02	1.53E-02	
B. Iodines							
1. Total Iodine-131	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	
C. Particulates							
1. Total Release, with half-life > 8 days	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	
3. Gross Alpha	Ci	-	-	-	-	0.00E+00	± 25
D. Tritium							
1. Total release	Ci	1.97E+00	5.05E+00	3.31E+00	2.70E+00	1.30E+01	± 25
2. Average release rate	uCi/sec	2.53E-01	6.42E-01	4.16E-01	3.40E-01	4.13E-01	
E. Carbon-14							
1. Total release	Ci	2.75E+00	2.75E+00	2.75E+00	2.75E+00	1.10E+01	
2. Average release rate	uCi/sec	3.54E-01	3.50E-01	3.46E-01	3.46E-01	3.49E-01	
		Qtr 1	**Qtr 2**	**Qtr 3**	**Qtr 4**	**2013**	

- Indicates < MDA

TABLE 1C
INDIAN POINT 1 and 2 **CONTINUOUS** GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013
Xe-133	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

2) Iodines						
I-131	Ci	-	-	-	-	0.00E+00
I-133	Ci	-	-	-	-	0.00E+00
I-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3) Particulates						
Co-58	Ci	-	-	-	-	0.00E+00
	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

- Indicates < MDA

TABLE 1C
INDIAN POINT 1 and 2 - **BATCH** GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

Nuclides Released		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013
1) Fission Gases	Units					
Ar-41	Ci	3.40E-02	2.75E-02	6.13E-02	6.34E-02	1.86E-01
Kr-85	Ci	-	-	-	-	0.00E+00
Kr-85m	Ci	-	3.32E-06	4.23E-04	2.19E-04	6.45E-04
Kr-87	Ci	-	2.74E-06	2.98E-04	1.83E-04	4.84E-04
Kr-88	Ci	-	5.95E-06	7.73E-04	3.77E-04	1.16E-03
Xe-131m	Ci	-	-	2.49E-05	-	2.49E-05
Xe-133	Ci	1.40E-01	1.22E-02	9.22E-02	2.91E-02	2.74E-01
Xe-133m	Ci	-	-	7.88E-06	-	7.88E-06
Xe-135	Ci	3.83E-03	5.13E-05	1.09E-02	3.53E-03	1.83E-02
Xe-135m	Ci	-	6.51E-06	6.77E-04	4.02E-04	1.09E-03
Xe-138	Ci	-	1.49E-06	-	1.17E-04	1.18E-04
Total for Period	Ci	1.78E-01	3.98E-02	1.67E-01	9.73E-02	4.82E-01

2) Iodines

Not Applicable for Batch Releases

- indicates < MDA

3) Particulates

Not Applicable for Batch Releases

TABLE 1A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013	Est. Total % Error
1. Total Release	Ci	2.99E-01	2.11E-02	1.70E-02	1.45E-02	3.52E-01	± 25
2. Average release rate	uCi/sec	3.85E-02	2.68E-03	2.14E-03	1.82E-03	1.11E-02	
B. Iodines							
1. Total Iodine-131	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	
C. Particulates							
1. Total Release, with half-life > 8 days	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	
3. Gross Alpha	Ci	-	-	-	-	0.00E+00	± 25
D. Tritium							
1. Total release	Ci	3.55E+00	3.29E+00	3.28E+00	3.15E+00	1.33E+01	± 25
2. Average release rate	uCi/sec	4.57E-01	4.18E-01	4.13E-01	3.96E-01	4.21E-01	
E. Carbon-14							
1. Total release	Ci	2.50E+00	2.50E+00	2.50E+00	2.50E+00	1.00E+01	
2. Average release rate	uCi/sec	3.22E-01	3.18E-01	3.15E-01	3.15E-01	3.17E-01	
		Qtr 1	**Qtr 2**	**Qtr 3**	**Qtr 4**	**2013**	

- Indicates < MDA

TABLE 1C
INDIAN POINT 3 - CONTINUOUS GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013
1) Fission Gases						
Ar-41	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	-	-	-	-	0.00E+00
Xe-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
2) Iodines						
I-131	Ci	-	-	-	-	0.00E+00
I-133	Ci	-	-	-	-	0.00E+00
I-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3) Particulates						
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

- indicates < MDA

TABLE 1C
INDIAN POINT 3 - BATCH GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013
1) Fission Gases						
Ar-41	Ci	1.12E-01	1.11E-02	1.34E-02	1.19E-02	1.48E-01
Kr-85	Ci	-	-	-	-	0.00E+00
Kr-85m	Ci	-	-	-	-	0.00E+00
Kr-87	Ci	-	-	-	-	0.00E+00
Kr-88	Ci	-	-	-	-	0.00E+00
Xe-131m	Ci	1.16E-04	-	-	-	1.16E-04
Xe-133	Ci	1.85E-01	8.95E-03	3.56E-03	2.56E-03	2.00E-01
Xe-133m	Ci	9.83E-04	-	-	-	9.83E-04
Xe-135	Ci	1.12E-03	9.90E-04	-	-	2.11E-03
Xe-135m	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	2.99E-01	2.10E-02	1.70E-02	1.45E-02	3.52E-01
2) Iodines						
Not Applicable for Batch Releases						
3) Particulates						
Not Applicable for Batch Releases						

- Indicates < MDA

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

C. LIQUID EFFLUENTS

2013

TABLE 2A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	2.15E-03	8.35E-03	9.57E-03	3.20E-02	5.21E-02	± 25
2. Average Diluted Conc	uCi/ml	4.61E-12	1.13E-11	1.11E-11	4.31E-11	1.85E-11	
B. Tritium							
1. Total Release	Ci	3.25E+02	1.13E+02	3.63E+02	5.10E+02	1.31E+03	± 25
2. Average Diluted Conc	uCi/ml	6.97E-07	1.53E-07	4.19E-07	6.86E-07	4.66E-07	
C. Dissolved & Entrained Gases							
1. Total Release	Ci	-	-	-	-	0.00E+00	± 25
2. AverageDiluted Conc	uCi/ml	-	-	-	-	0.00E+00	
D. Gross Alpha							
1. Total Release	Ci	-	-	-	-	0.00E+00	± 25
E. Volume of Waste Released							
1. Processed Waste (LW & NCD)	liters	2.27E+06	2.42E+06	1.66E+06	4.72E+06	1.11E+07	± 10
2. Unprocessed (SGBD, SFDS, U1FD)	liters	4.21E+07	4.44E+07	7.34E+07	7.43E+07	2.34E+08	± 10
F. Volume of Dilution Water	liters	4.66E+11	7.37E+11	8.66E+11	7.43E+11	2.81E+12	± 10

- Indicates < MDA

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

CONTINUOUS RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013
Cs-137	Ci	1.12E-03	4.83E-03	4.41E-03	2.03E-02	3.07E-02
Ni-63	Ci	-	-	-	-	0.00E+00
Sr-89	Ci	-	-	-	-	0.00E+00
Sr-90	Ci	1.70E-04	1.46E-04	7.47E-05	1.18E-04	5.09E-04
Total for Period	Ci	1.29E-03	4.98E-03	4.48E-03	2.04E-02	3.12E-02
H-3 (only)	Ci	1.22E-01	1.31E-01	7.32E-02	1.41E-01	4.67E-01

- Indicates < MDA

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

BATCH RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013
Ag-110m	Ci	-	9.90E-04	4.79E-04	3.52E-04	1.82E-03
Co-58	Ci	-	2.00E-05	6.03E-04	4.64E-04	1.09E-03
Co-60	Ci	1.71E-05	3.35E-04	6.77E-05	1.21E-04	5.41E-04
Fe-55	Ci	-	5.28E-04	3.42E-04	-	8.70E-04
Ni-63	Ci	-	-	1.18E-03	8.94E-03	1.01E-02
Sb-125	Ci	8.43E-04	1.40E-03	2.42E-03	1.74E-03	6.40E-03
Total for Period	Ci	8.60E-04	3.27E-03	5.09E-03	1.16E-02	**2.08E-02**

Dissolved & Entrained Gas

Kr-85	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

- Indicates < MDA

TABLE 2A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2013	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	1.07E-02	7.88E-03	3.07E-03	2.48E-03	2.41E-02	± 25
2. Average Diluted Conc	uCi/ml	2.30E-11	1.07E-11	3.55E-12	3.34E-12	8.58E-12	
B. Tritium							
1. Total Release	Ci	5.20E+02	5.09E+01	7.95E+00	1.56E+02	7.35E+02	± 25
2. Average Diluted Conc	uCi/ml	1.12E-06	6.91E-08	9.18E-09	2.10E-07	2.61E-07	
C. Dissolved & Entrained Gases							
1. Total Release	Ci	2.66E-03	2.40E-05	-	3.69E-05	2.72E-03	± 25
2. AverageDiluted Conc	uCi/ml	5.71E-12	3.26E-14	0.00E+00	4.97E-14	9.68E-13	
D. Gross Alpha							
1. Total Release	Ci	-	-	-	-	0.00E+00	± 25
E. Volume of Waste Released							
1. Processed Fluids (Mon Tanks)	liters	1.57E+06	9.12E+05	2.03E+05	4.89E+05	3.17E+06	± 10
2. Unprocessed Fluids (SGs)	liters	4.80E+06	6.86E+06	2.36E+06	1.64E+06	1.57E+07	± 10
F. Volume of Dilution Water	liters	4.66E+11	7.37E+11	8.66E+11	7.43E+11	2.81E+12	± 10

'- indicates < MDA

TABLE 2B
INDIAN POINT 3 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2013)
BATCH and CONTINUOUS RADIOACTIVE LIQUID EFFLUENT

Batch Fission/Activation Products

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	2013
Co-58	Ci	6.58E-04	4.08E-03	9.10E-04	3.59E-04	6.01E-03
Co-60	Ci	1.70E-03	2.58E-04	7.85E-05	8.87E-05	2.13E-03
Cr-51	Ci	1.54E-05	1.15E-04	-	-	1.30E-04
Cs-137	Ci	1.76E-04	1.87E-06	-	9.48E-06	1.87E-04
Fe-55	Ci	6.68E-04	-	-	-	6.68E-04
Mn-54	Ci	4.97E-06	7.70E-06	-	-	1.27E-05
Ni-63	Ci	3.45E-03	1.12E-03	1.69E-03	1.80E-03	8.06E-03
Sb-124	Ci	2.17E-04	2.51E-04	2.05E-05	-	4.89E-04
Sb-125	Ci	3.05E-03	8.88E-04	3.75E-04	2.00E-04	4.51E-03
Te-123m	Ci	8.64E-05	1.56E-04	-	2.68E-05	2.69E-04
Te-125m	Ci	6.16E-04	9.95E-04	-	-	1.61E-03
Zn-65	Ci	-	6.81E-06	-	-	6.81E-06
Total for Period	Ci	1.06E-02	7.88E-03	3.07E-03	2.48E-03	2.41E-02

Dissolved and Entrained Gas (Batch)

Xe-133	Ci	2.66E-03	2.40E-05	-	3.69E-05	2.72E-03
Xe-135	Ci	2.37E-06	-	-	-	2.37E-06
		-	-	-	-	0.00E+00
Total for Period	Ci	2.66E-03	2.40E-05	0.00E+00	3.69E-05	2.72E-03

Continuous Releases (SG Blowdown)

H-3 (only)	Ci	-	5.47E-04	4.02E-03	3.21E-03	7.78E-03

'- indicates < mda

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

D. SOLID WASTE

2013

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evap Bottoms — LWS Resin
Plant Resin 8-120 — 2011 Filters WMG — Rx Cavity/SFP Demin

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	1.77E+02	5.01E+00	5.52E+00	+/- 25%
B	0.00E+00	0.00E+00	0.00E+00	+/- 25%
C	1.38E+02	3.91E+00	6.88E+01	+/- 25%
All	3.15E+02	8.92E+00	7.43E+01	+/- 25%

Waste Stream : Dry Active Waste — Soil / Bebris Intermodal
Scrap Metal 20' Sea Land — DAW/Dirt; B-25 Box — DAW 20' Sea Land

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	1.98E+04	5.60E+02	5.36E-02	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	1.98E+04	5.60E+02	5.36E-02	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream: Other Waste

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream: Sum of All 4 Categories
LWS Resin
DAW / Dirt; B-25 Box DAW 20' Sea Land
Soil / Debris - Intermodal

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.00E+04	5.65E+02	5.57E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	1.38E+02	3.91E+00	6.88E+01	+/-25%
All	2.01E+04	5.69E+02	7.44E+01	+/-25%

Combined Waste Type Shipment, Major Volume Waste Type Shown

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
1	Hittman Transport	Barnwell Processing Facility
4	Hittman Transport	Energy Solutions – Bear Creek
50	R & R Trucking Inc.	Studsvik Processing - Memphis
1	Hittman Transport	Studsvik Processing Facility

Resins, Filters, and Evaporator Bottoms
Waste Class A

Nuclide Name	% Abundance	Curies
H-3	13.39%	7.38E-01
C-14	12.81%	7.06E-01
Mn-54	0.16%	8.78E-03
Fe-55	9.45%	5.21E-01
Fe-59	0.01%	5.73E-04
Co-57	0.14%	7.52E-03
Co-58	1.62%	8.95E-02
Co-60	8.43%	4.65E-01
Ni-63	23.40%	1.29E+00
Zn-65	0.04%	2.17E-03
Zr-95	0.01%	5.25E-04
Ag-110m	0.07%	3.81E-03
Sb-125	3.86%	2.13E-01
Cs-134	0.70%	3.88E-02
Cs-137	25.92%	1.43E+00

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Resins, Filters, and Evaporator Bottoms
Waste Class C

Nuclide Name	% Abundance	Curies
C-14	3.54%	2.44E+00
Mn-54	0.31%	2.10E-01
Fe-55	19.68%	1.35E+01
Co-57	0.15%	1.04E-01
Co-58	4.02%	2.77E+00
Co-60	13.64%	9.39E+00
Ni-63	51.53%	3.55E+01
Sr-90	0.10%	6.75E-02
Nb-94	0.03%	1.92E-02
Ag-110m	1.82%	1.25E+00
Sb-125	3.39%	2.33E+00
Cs-134	0.12%	8.10E-02
Cs-137	1.69%	1.17E+00

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Resins, Filters, and Evaporator Bottoms

Waste Class All

Nuclide Name	% Abundance	Curies
H-3	0.99%	7.38E-01
C-14	4.23%	3.14E+00
Mn-54	0.29%	2.19E-01
Fe-55	18.92%	1.41E+01
Fe-59	0.00%	5.73E-04
Co-57	0.15%	1.12E-01
Co-58	3.84%	2.86E+00
Co-60	13.25%	9.85E+00
Ni-63	49.44%	3.68E+01
Zn-65	0.00%	2.17E-03
Sr-90	0.09%	6.75E-02
Zr-95	0.00%	5.25E-04
Nb-94	0.03%	1.92E-02
Ag-110m	1.69%	1.25E+00
Sb-125	3.42%	2.54E+00
Cs-134	0.16%	1.20E-01
Cs-137	3.49%	2.59E+00

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Dry Active Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	1.11%	5.96E-04
Mn-54	2.08%	1.11E-03
Fe-55	15.66%	8.39E-03
Co-57	0.10%	5.20E-05
Co-60	54.92%	2.94E-02
Ni-63	10.73%	5.75E-03
Sb-125	1.00%	5.37E-04
Cs-134	0.27%	1.45E-04
Cs-137	14.13%	7.57E-03

Dry Active Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
C-14	1.11%	5.96E-04
Mn-54	2.08%	1.11E-03
Fe-55	15.66%	8.39E-03
Co-57	0.10%	5.20E-05
Co-60	54.92%	2.94E-02
Ni-63	10.73%	5.75E-03
Sb-125	1.00%	5.37E-04
Cs-134	0.27%	1.45E-04
Cs-137	14.13%	7.57E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	13.26%	7.38E-01
C-14	12.70%	7.07E-01
Mn-54	0.18%	9.89E-03
Fe-55	9.51%	5.29E-01
Fe-59	0.01%	5.73E-04
Co-57	0.14%	7.57E-03
Co-58	1.61%	8.95E-02
Co-60	8.88%	4.95E-01
Ni-63	23.28%	1.30E+00
Zn-65	0.04%	2.17E-03
Zr-95	0.01%	5.25E-04
Ag-110m	0.07%	3.81E-03
Sb-125	3.83%	2.13E-01
Cs-134	0.70%	3.90E-02
Cs-137	25.80%	1.44E+00

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Sum of All 4 Categories

Waste Class C

Nuclide Name	Percent Abundance	Curies
C-14	3.54%	2.44E+00
Mn-54	0.31%	2.10E-01
Fe-55	19.68%	1.35E+01
Co-57	0.15%	1.04E-01
Co-58	4.02%	2.77E+00
Co-60	13.64%	9.39E+00
Ni-63	51.53%	3.55E+01
Sr-90	0.10%	6.75E-02
Nb-94	0.03%	1.92E-02
Ag-110m	1.82%	1.25E+00
Sb-125	3.39%	2.33E+00
Cs-134	0.12%	8.10E-02
Cs-137	1.69%	1.17E+00

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Sum of All 4 Categories

Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.99%	7.38E-01
C-14	4.23%	3.14E+00
Mn-54	0.30%	2.20E-01
Fe-55	18.92%	1.41E+01
Fe-59	0.00%	5.73E-04
Co-57	0.15%	1.12E-01
Co-58	3.84%	2.86E+00
Co-60	13.28%	9.88E+00
Ni-63	49.41%	3.68E+01
Zn-65	0.00%	2.17E-03
Sr-90	0.09%	6.75E-02
Zr-95	0.00%	5.25E-04
Nb-94	0.03%	1.92E-02
Ag-110m	1.69%	1.25E+00
Sb-125	3.42%	2.54E+00
Cs-134	0.16%	1.20E-01
Cs-137	3.50%	2.60E+00

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evaporator Bottoms
LWS Resin 14-215

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	1.48E+02	4.19E+00	1.64E+00	+/- 25%
B	0.00E+00	0.00E+00	0.00E+00	+/- 25%
C	0.00E+00	0.00E+00	0.00E+00	+/- 25%
All	1.48E+02	4.19E+00	1.64E+00	+/- 25%

Waste Stream : Dry Active Waste
Unit 3 DAW-20' Sealand U3 DAW B-25 20' Intermodal Soil

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.04E+04	5.77E+02	9.20E-01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.04E+04	5.77E+02	9.20E-01	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream : Other Waste

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream : Sum of All 4 Categories LWS Resin 14-215
Unit 3 DAW-20' Sealand U3 DAW B-25 20' Intermodal Soil

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.05E+04	5.81E+02	2.56E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.05E+04	5.81E+02	2.56E+00	+/-25%

Combined Waste Type Shipment, Major Volume Waste Type Shown

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
1	Hittman Transport	Barnwell Processing Facility
9	Hittman Transport	Energy Solutions Bear Creek
9	R & R Trucking	Studsvik Processing – Memphis

Resins, Filters, and Evaporator Bottoms

Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	1.50%	2.47E-02
Mn-54	0.22%	3.58E-03
Fe-55	11.10%	1.82E-01
Co-57	0.05%	8.71E-04
Co-58	0.09%	1.50E-03
Co-60	9.11%	1.50E-01
Ni-59	0.47%	7.75E-03
Ni-63	50.58%	8.30E-01
Sr-90	0.01%	2.17E-04
Sb-125	22.45%	3.68E-01
Cs-137	4.22%	6.92E-02
Ce-144	0.12%	2.04E-03
Pu-241	0.07%	1.07E-03
Am-241	0.00%	5.10E-06
Cm-243	0.00%	2.57E-06

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Resins, Filters, and Evaporator Bottoms

Waste Class All

Nuclide Name	Percent Abundance	Curies
C-14	1.50%	2.47E-02
Mn-54	0.22%	3.58E-03
Fe-55	11.10%	1.82E-01
Co-57	0.05%	8.71E-04
Co-58	0.09%	1.50E-03
Co-60	9.11%	1.50E-01
Ni-59	0.47%	7.75E-03
Ni-63	50.58%	8.30E-01
Sr-90	0.01%	2.17E-04
Sb-125	22.45%	3.68E-01
Cs-137	4.22%	6.92E-02
Ce-144	0.12%	2.04E-03
Pu-241	0.07%	1.07E-03
Am-241	0.00%	5.10E-06
Cm-243	0.00%	2.57E-06

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Dry Active Waste

Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	2.73%	2.51E-02
Cr-51	0.15%	1.33E-03
Mn-54	0.19%	1.72E-03
Fe-55	5.09%	4.68E-02
Co-57	0.01%	1.08E-04
Co-58	2.29%	2.11E-02
Co-60	20.40%	1.88E-01
Ni-63	59.88%	5.51E-01
Sr-90	0.23%	2.12E-03
Zr-95	0.61%	5.63E-03
Nb-95	1.12%	1.03E-02
Sn-113	0.03%	2.27E-04
Sb-125	0.11%	1.03E-03
Cs-134	0.43%	3.93E-03
Cs-137	6.73%	6.19E-02

Dry Active Waste

Waste Class All

Nuclide Name	Percent Abundance	Curies
C-14	2.73%	2.51E-02
Cr-51	0.15%	1.33E-03
Mn-54	0.19%	1.72E-03
Fe-55	5.09%	4.68E-02
Co-57	0.01%	1.08E-04
Co-58	2.29%	2.11E-02
Co-60	20.40%	1.88E-01
Ni-63	59.88%	5.51E-01
Sr-90	0.23%	2.12E-03
Zr-95	0.61%	5.63E-03
Nb-95	1.12%	1.03E-02
Sn-113	0.03%	2.27E-04
Sb-125	0.11%	1.03E-03
Cs-134	0.43%	3.93E-03
Cs-137	6.73%	6.19E-02

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Sum of All 4 Categories

Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	1.94%	4.98E-02
Cr-51	0.05%	1.33E-03
Mn-54	0.21%	5.30E-03
Fe-55	8.94%	2.29E-01
Co-57	0.04%	9.78E-04
Co-58	0.88%	2.26E-02
Co-60	13.17%	3.37E-01
Ni-59	0.30%	7.75E-03
Ni-63	53.92%	1.38E+00
Sr-90	0.09%	2.33E-03
Zr-95	0.22%	5.63E-03
Nb-95	0.40%	1.03E-02
Sn-113	0.01%	2.27E-04
Sb-125	14.43%	3.70E-01
Cs-134	0.15%	3.93E-03
Cs-137	5.12%	1.31E-01
Ce-144	0.08%	2.04E-03
Pu-241	0.04%	1.07E-03
Am-241	0.00%	5.10E-06
Cm-243	0.00%	2.57E-06

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2013 to 12/31/2013

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class All

Nuclide Name	Percent Abundance	Curies
C-14	1.94%	4.98E-02
Cr-51	0.05%	1.33E-03
Mn-54	0.21%	5.30E-03
Fe-55	8.94%	2.29E-01
Co-57	0.04%	9.78E-04
Co-58	0.88%	2.26E-02
Co-60	13.17%	3.37E-01
Ni-59	0.30%	7.75E-03
Ni-63	53.92%	1.38E+00
Sr-90	0.09%	2.33E-03
Zr-95	0.22%	5.63E-03
Nb-95	0.40%	1.03E-02
Sn-113	0.01%	2.27E-04
Sb-125	14.43%	3.70E-01
Cs-134	0.15%	3.93E-03
Cs-137	5.12%	1.31E-01
Ce-144	0.08%	2.04E-03
Pu-241	0.04%	1.07E-03
Am-241	0.00%	5.10E-06
Cm-243	0.00%	2.57E-06

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

E. RADIOLOGICAL IMPACT ON MAN

Jan 1, 2013 - Dec 31, 2013

RADIOLOGICAL IMPACT ON MAN

Routine Effluent Dose Calculations:

The Radiological Impact on Man due to radioactive effluent from the site is determined from NRC approved modeling, per Reg Guide 1.109 and NUREG 0133. Calculations are divided into 3 categories: Noble Gases, Particulates and Iodine, and Liquid Releases (fish and invertebrate consumption). This modeling involves conservative dose calculations to Adult, Teen, Child, and Infant age groups. Furthermore, dose modeling is performed for six separate organs as well as the total body dose. This well-established industry model provides doses (as a result of plant effluent) to a hypothetical maximally exposed individual offsite. While ALL age groups and organs are considered, it is this ***maximum value*** that is provided in the tables that follow.

An approved computer code is used to perform liquid and gaseous dose calculations according to the models and parameters presented in the Indian Point Offsite Dose Calculation Manual (ODCM). This information is stored in a database on site to enhance dose tracking and information management. Site airborne effluent dose calculations include annual average dispersion and deposition factors, averaged from data collected over approximately ten year periods. When new data is averaged (approximately every ten years) the modeling is updated and used in subsequent airborne effluent calculations.

Liquid offsite dose calculations involve fish and invertebrate consumption pathways only, as determined appropriate in the ODCM. While the ODCM identified some site-specific dose factors, the bulk of this information is obtained directly from Regulatory Guide 1.109 and NUREG 0133. Details of the calculations, site-specific data, and their bases are presented in the ODCM.

Carbon-14 (C-14):

Concentrations and offsite dose from C-14 were determined from sampling at Indian Point #3 from August 1980 to June 1982, during a study conducted by the NY State Department of Health (C. Kunz, later published and incorporated into NCRP 81). The annual C-14 curies released, as determined from this study, were consistent with NUREG 0017, Rev. 1. Data was then normalized to a maximum expected annual total, based on rated electrical capacity, (approximately 1000 MW(e) maintained for the entire year). Once the curies released were established, dose calculations were performed per the station ODCM, which uses all C-14 released to determine inhalation doses, and 26% of the total (determined to be Carbon Dioxide form), to determine the ingestion doses, in accordance with Reg Guide 1.109.

In 2010, IPEC and other facilities combined historical data with the application of an EPRI model designed to estimate C-14 releases, given some key site-specific plant parameters (mass of the primary coolant, average thermal neutron cross section, rated MW, etc). The estimates from this model, for IPEC, closely match the measured observations of 1982.

The maximum annual C-14 release information is as follows:

Maximum (Bounding) Annual C-14 releases from IPEC		**Unit 2**	**Unit 3**
Liquid Effluent C^{14} Released	Curies	**0.07**	**0.07**
Total Airborne C^{14} Released	Curies	**11.19**	**11.05**
Airborne C^{14} as CO_2	Curies	**2.91**	**2.87**

Airborne Effluent Child TB Dose, C^{14}	mrem	**0.0690**	**0.0675**
Airborne Effluent Child Bone Dose, C^{14}	mrem	**0.346**	**0.338**
Liquid Effluent Child TB Dose, C^{14}	mrem	**0.00117**	**0.00116**
Liquid Effluent Child Bone Dose, C^{14}	mrem	**0.00583**	**0.00577**

The bounding values were then normalized with actual effective full power days (EFFD) to yield more accurate year to year annual airborne curies and mrem for each unit. A small liquid effluent component is maintained at IPEC as a result of data accumulated in the 1983 study (Kunz). Tables 1A (shown earlier) include the airborne curie data for the current year. The following section (Radiological Impact on Man) includes the dose information.

C-14 doses are grouped with "Iodine and Particulate" and reported in Table D in the following Radiological Impact on Man tables, for each unit. Table "C" provides doses from this category *excluding* C-14, to facilitate historical comparisons. However, since C-14 is grouped as a particulate, the total dose for this isotope needs to be added to all other Iodines and Particulates, for comparison of the singular dose limit for this category.

Therefore, table "D" includes dose from all categories of this group (Iodine, Particulate, Tritium, and Carbon-14), for appropriate comparison of the dose limits.

C-14 doses (alone) for the current year are provided (for information) in the following table:

Calculated Annual C-14 releases from IPEC, **2013**		**Unit 2**	**Unit 3**
Airborne Effluent Child TB Dose, C^{14}	mrem	**0.0676**	**0.0611**
Airborne Effluent Child Bone Dose, C^{14}	mrem	**0.339**	**0.306**

The airborne effluent dose from C-14 is distributed evenly over the year and applied to a total Iodine and Particulate dose in Table "D" following this section.

Members of the Public:

Members of the public visiting the site receive minimal dose as a result of onsite releases because of the relatively insignificant total amount of time they are on site, as well as the immeasurably low levels of dose at the critical receptors. Their doses can be calculated from standard ODCM methodology, with typical occupancy factors employed. These factors are determined by comparing a conservative assumption for their expected hours on site, to 8760 hours (the number of hours in a year, used in calculations in the ODCM).

example 1: Several students visit the site for an 8-hour guided tour.

Their occupancy factor is: 8 / 8760 or **0.0009**.

example 2: A man drives his wife to work and drops her off at the security gate each morning, with a total stay-time on site for 2 minutes per day. His occupancy factor is calculated as follows:

2 min/60 min/hr =0.0333 hr; 0.0333 / 8760 = **3.8E-6.**

While onsite meteorological factors (dispersion and deposition) may be as high as a factor of ten higher than those used by the ODCM for routine effluents, these occupancy factors, when multiplied by doses calculated per the ODCM, demonstrate that dose to MEMBERS OF THE PUBLIC within the site boundary is negligible.

Groundwater:

Curies and dose contribution from activity discovered in onsite groundwater and storm drain pathways during the year are discussed in more detail in Section H. The offsite dose calculation involves multiple source term measurements, as well as computations for release and dilution flow. A summary of the quantification methodology, and the resulting calculated doses, is provided at the end of Section H. The Total Dose table below provides a means to compare ground water doses with those of other components making up the total offsite dose.

Total Dose:

Unit and pathway-specific dose data can be found on the Radiological Impact on Man tables following this discussion. For simplicity and to demonstrate compliance with 40CFR190, the following table indicates the maximum hypothetical Total Dose to an individual from operation of the facility, including any measured direct shine component from the site property:

Year: 2013		Total Body	Max Organ
40 CFR 190 limit ===→	**IPEC**	**25 mrem**	**75 mrem**
Routine Airborne Effluents[1]	**Units 1 and 2**	**2.26E-03**	**2.26E-03**
Routine Liquid Effluents	**Units 1 and 2**	**1.17E-03**	**1.90E-03**
Liquid Releases of C^{14}	Units 1 and 2	1.17E-03	5.83E-03
Airborne Releases of C^{14}	Units 1 and 2	6.76E-02	3.39E-01
Routine Airborne Effluents[1]	**Unit 3**	**2.25E-03**	**2.25E-03**
Routine Liquid Effluents	**Unit 3**	**2.05E-04**	**4.45E-04**
Liquid Releases of C^{14}	Unit 3	1.17E-03	5.83E-03
Airborne Releases of C^{14}	Unit 3	6.11E-02	3.06E-01
Ground Water & Storm Drain Totals	**IPEC[2]**	**7.78E-05**	**3.15E-04**
Direct Shine from areas such as dry cask storage, radwaste storage, SG Mausoleum, etc.	**IPEC[3]**	**1.30E-01**	**1.30E-01**
Indian Point Energy Center Total Dose, per 40 CFR 190	**IPEC**	**2.67E-01**	**7.94E-01**

Note 1: Routine airborne dose in this table is conservatively represented as a sum of Iodine, Particulate, and Tritium dose (excluding C-14, in mrem) with a mrem term added from noble gas gamma air energy (mrad, expressed as mrem). This 'addition' does not represent a real dose and is listed here solely to help demonstrate compliance with 40CFR190. (Doses by type of release and comparison to the specific limits of 10CFR50 Appendix I are summarized on the following pages.)

Note 2: Groundwater curie and dose calculations are provided in Section H.

Note 3: 40CFR190 requires the reporting of total dose, including that of direct shine. Direct shine dose from sources other than dry cask are indistinguishable from background. Direct shine dose is determined from TLDs near the dry cask area and site boundary, compared with REMP TLDs and historical values, and corrected with occupancy factors to determine a bounding, worst case assessment of direct shine dose to a real individual. These doses are slightly higher than those of the previous year due to additional storage on the Independent Spent fuel Storage Installation (ISFSI). Details of each year's dose evaluation are available on site from Radiation Protection.

INDIAN POINT UNITS 1 and 2 NUCLEAR POWER PLANTS
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2013

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	1.60E-04	2.61E-04	2.29E-04	1.26E-03	**1.90E-03**
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	3.20E-03	5.22E-03	4.58E-03	2.52E-02	1.90E-02
Age Group		Adult	Child	Child	Child	Child
Critical Organ		Liver	bone	Bone	Bone	Bone
Adult Total Body	(mrem)	1.59E-04	1.70E-04	1.67E-04	6.78E-04	**1.17E-03**
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3.0
Percent of Limit	(%)	1.06E-02	1.13E-02	1.11E-02	4.52E-02	3.91E-02

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	1.66E-05	1.09E-05	2.74E-05	2.58E-05	**8.07E-05**
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	3.32E-04	2.18E-04	5.48E-04	5.16E-04	8.07E-04
Beta Air	(mrad)	1.89E-05	7.27E-06	2.33E-05	1.77E-05	**6.72E-05**
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	1.89E-04	7.27E-05	2.33E-04	1.77E-04	3.36E-04

C. AIRBORNE IODINE, PARTICULATE, & TRITIUM DOSES (excluding C-14, for info only)

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	3.31E-04	8.46E-04	5.55E-04	4.52E-04	**2.18E-03**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	4.41E-03	1.13E-02	7.40E-03	6.03E-03	1.46E-02
Age Group		Child	Child	Child	Child	Child
Critical Organ		Liver	Liver	Liver	Liver	Liver

D. AIRBORNE IODINE, PARTICULATE, TRITIUM, and CARBON-14 DOSES

Child TB Dose	(mrem)	1.72E-02	1.77E-02	1.75E-02	1.74E-02	**6.98E-02**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	2.30E-01	2.37E-01	2.33E-01	2.31E-01	4.65E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Child Bone Dose	(mrem)	8.48E-02	8.48E-02	8.48E-02	8.48E-02	**3.39E-01**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	1.13E+00	1.13E+00	1.13E+00	1.13E+00	2.26E+00

INDIAN POINT 3 NUCLEAR POWER PLANT
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2013

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	2.63E-04	5.22E-05	5.90E-05	7.38E-05	**4.45E-04**
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	5.26E-03	1.04E-03	1.18E-03	1.48E-03	4.45E-03
Age Group		Child	Adult	Child	Child	Child
Critical Organ		Bone	GILLI	Bone	Bone	Bone
Adult Total Body	(mrem)	1.59E-04	1.42E-05	3.26E-06	2.86E-05	**2.05E-04**
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3.0
Percent of Limit	(%)	1.06E-02	9.47E-04	2.17E-04	1.91E-03	6.84E-03

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	3.71E-05	3.52E-06	3.89E-06	3.44E-06	**4.80E-05**
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	7.42E-04	7.04E-05	7.78E-05	6.88E-05	4.80E-04
Beta Air	(mrad)	8.02E-05	6.86E-06	6.78E-06	5.92E-06	**9.98E-05**
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	8.02E-04	6.86E-05	6.78E-05	5.92E-05	4.99E-04

C. AIRBORNE IODINE, PARTICULATE, & TRITIUM DOSES (excluding C-14, for info only)

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	5.87E-04	5.44E-04	5.43E-04	5.21E-04	**2.20E-03**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	7.83E-03	7.25E-03	7.24E-03	6.95E-03	1.46E-02
Age Group		Child	Child	Child	Child	Child
Critical Organ		Liver	Liver	Liver	Liver	Liver

D. AIRBORNE IODINE, PARTICULATE, TRITIUM, and CARBON-14 DOSES

Child TB Dose	(mrem)	1.59E-02	1.58E-02	1.58E-02	1.58E-02	**6.33E-02**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	2.11E-01	2.11E-01	2.11E-01	2.11E-01	4.22E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Child Bone Dose	(mrem)	7.65E-02	7.65E-02	7.65E-02	7.65E-02	**3.06E-01**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	1.02E+00	1.02E+00	1.02E+00	1.02E+00	2.04E+00

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOLOGICAL EFFLUENT REPORT

F. METEOROLOGICAL DATA

Jan 1, 2013 - Dec 31, 2013

This data is stored onsite and is available in printed or electronic form.

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

G. OFFSITE DOSE CALCULATION MANUAL, REMP SAMPLING LOCATIONS, PROCESS CONTROL PROGRAM, OR LAND USE CENSUS LOCATION CHANGES

2013

There were no changes to the REMP Sampling Locations in 2013.

There were no changes in the Land Use Census in 2013.

The Process Control Program (PCP) was updated in 2013

An administrative update to this fleet procedure was performed to ensure inter-changeable position titles for the "General Plant Manager" and "Plant Superintendent" at Palisades. See the enclosed fleet procedure.

There were no changes to the IPEC ODCM in 2013

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

H. GROUNDWATER and STORM WATER REPORT

ACTIVITY ON SITE and OFFSITE DOSE CALCULATION

FOR THE PERIOD:

Jan 1, 2013 - Dec 31, 2013

Summary of IPEC Groundwater and Storm Water Activity, 2013

The precipitation mass balance model applied in previous years was applied for offsite dose calculations in 2013, with some minor calibration updates performed by the contractor with regard to the distribution of groundwater flow through the site. Groundwater elevation readings continued to validate the model throughout the year.

As defined in the ODCM, a conservative method of source term selection is used for determining offsite dose from Groundwater and Storm Water. If a result is *below MDC* (whether positive or negative) it is *not* included in the computed average. This computed average is therefore biased high (more conservative from a dose computation perspective) relative to an average computed using all of the data (many of which indicate no activity). In cases where all the sampling locations assigned to a given stream tube provided results below the MDC, then an average activity value of zero was assigned to the effected portion of the stream tube. (This mathematically allows the calculation to proceed in the absence of positive detections).

Historical average precipitation at IPEC has been approximately 3 feet per year. In 2011, precipitation was unusually high (over 6 feet). In 2013, precipitation was measured at 2.81 feet per year (or inches per month, as an average). Doses from Groundwater/Storm water are dependent on two factors: source term and precipitation during the effected year.

Results of 2013 Groundwater and Storm water offsite dose evaluation

The results of the assessment are shown on the following table. These dose values are a small portion of the annual limits (<0.005%), and were added to the Total Dose table in the opening summary of the Dose to Man section of this report (Section E).

Groundwater (GW) and storm water tritium released from IPEC in 2013 totaled approximately 0.199 curies, resulting in a total body dose of significantly less than 0.1 mrem (2.4E-7 mrem). It is evident that tritium alone, whether from ground water or routine effluents, does not arithmetically contribute to integrated offsite dose.

Sampling near the effluent points identified only trace levels of Cesium-137, Tritium and Strontium-90. These data, as part of the Monitored Natural Attenuation analyses, show a continuation of the decreasing trends established with the termination of the identified Unit 2 SFP leaks (tritium plume) and the defueling and draining of Unit 1 SFPs (strontium plume). Strontium-90, a legacy isotope from Unit 1, contributed approximately 0.000022 curies to site effluent from the groundwater pathway. Combined GW releases from IPEC in 2013 (all radionuclides) resulted in a calculated annual dose of less than 0.0032% of the annual limits for whole body and critical organ:

IPEC Groundwater and Storm Water Effluent Dose, 2013

0.0000778 mrem to the total body	(0.00259% limit)
0.000315 mrem to the critical organ, adult bone	(0.00315% limit)

The annual dose from combined groundwater and storm water pathways remains well below applicable limits. When combined with routine liquid effluents (Section E), the total dose also remains significantly below ALARA limits of 3 mrem total body, and 10 mrem to the critical organ.

IPEC Summary for Storm & Ground Water releases (H-3, Co-60, Ni-63, Sr-90, and Cs-137)

2013
year

Northern Clean Zone

Adult Doses,in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.30E+02
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09	3.69E-09	**3.30E+02**

Unit 2 North

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	1.01E-08	1.01E-08	1.01E-08	1.01E-08	1.01E-08	1.01E-08	4.84E+04
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	1.01E-08	1.01E-08	1.01E-08	1.01E-08	1.01E-08	1.01E-08	**4.84E+04**

Unit 1/2

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	5.23E-08	5.23E-08	5.23E-08	5.23E-08	5.23E-08	5.23E-08	9.63E+03
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	1.06E-04	0.00E+00	2.60E-05	0.00E+00	0.00E+00	0.00E+00	3.05E-06	1.37E+01
Cs-137	5.07E-07	6.94E-07	4.55E-07	0.00E+00	2.35E-07	7.83E-08	1.34E-08	1.54E+01
totals	1.06E-04	7.46E-07	2.65E-05	5.23E-08	2.88E-07	1.31E-07	3.12E-06	**9.65E+03**

Unit 3 North

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	7.90E-08	7.90E-08	7.90E-08	7.90E-08	7.90E-08	7.90E-08	9.13E+03
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	2.09E-04	0.00E+00	5.12E-05	0.00E+00	0.00E+00	0.00E+00	6.01E-06	8.32E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	2.09E-04	7.90E-08	5.12E-05	7.90E-08	7.90E-08	7.90E-08	6.09E-06	**9.14E+03**

Unit 3 South

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	7.85E-08	7.85E-08	7.85E-08	7.85E-08	7.85E-08	7.85E-08	4.80E+04
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	7.85E-08	7.85E-08	7.85E-08	7.85E-08	7.85E-08	7.85E-08	**4.80E+04**

Southern Clean Zone

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	1.46E-08	1.46E-08	1.46E-08	1.46E-08	1.46E-08	1.46E-08	8.30E+04
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	1.46E-08	1.46E-08	1.46E-08	1.46E-08	1.46E-08	1.46E-08	**8.30E+04**

Totals:

Adult Doses, in mrem

								Total uCi	
H-3 only	0.00E+00	2.38E-07	2.38E-07	2.38E-07	2.38E-07	2.38E-07	2.38E-07	1.99E+05	H3
	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	0.00E+00	Co
all isotopes	**3.15E-04**	9.32E-07	**7.78E-05**	2.38E-07	4.74E-07	3.16E-07	9.31E-06	0.00E+00	Ni
								2.20E+01	Sr
Adult Doses								1.54E+01	Cs
% Annual Limit	*0.00315*	*0.000*	*0.00259*	*0.000*	*0.000*	*0.000*	*0.000*		

INDIAN POINT
RADIOLOGICAL GROUNDWATER MONITORING PROGRAM

2013

Summary of Results

The following pages represent the isotopic radio-analytical data for all onsite groundwater testing performed at Indian Point in 2013, as required per the ODCM and NEI 07-07.

(The units on the following pages are pCi/L)

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
B-1	drain pipe into manhole checked several times per quarter; no water available for samples															
B-6	1/29	1.8	6.6	4/10	-4.0	9.1	7/9	3.4	8.0				10/16	1.2	9.5	0.6
I-2	2/6	1.1	7.9	4/24	0.9	9.3	7/31	-1.5	9.7				11/4	-1.4	10.0	-0.2
MH-5	1/30	4.6	8.4	4/11	4.4	8.4	7/12	1.4	10.2				10/24	-3.5	8.6	1.7
MW-107				5/6	1.8	10.3										1.8
MW-111				4/23	3.9	7.0							12/12	-1.7	6.5	1.1
MW-30-69	2/21	-2.2	9.2	5/2	-3.7	7.7	8/30	0.0	5.3				12/4	-3.1	8.6	-2.2
MW-30-84	2/21	0.3	7.2	5/2	-3.8	8.6	8/30	-0.5	5.3				12/4	-2.1	6.7	-1.5
MW-31-49	2/4	-0.8	8.4	4/22	2.7	7.1	7/15	-3.9	10.1				10/28	2.3	6.2	0.0
MW-31-63	2/4	0.2	8.0	4/22	4.3	9.8	7/15	-5.1	8.9				10/28	2.4	5.4	0.4
MW-31-85	2/4	-0.5	8.5	4/22	-1.8	9.2	7/15	2.4	9.3				10/28	1.9	6.2	0.5
MW-32-149	2/4	3.1	8.1	4/22	2.0	7.6	7/15	-1.2	8.6				10/28	0.2	7.5	1.0
MW-32-173	2/4	-1.9	9.8	4/22	5.0	6.0	7/15	-1.7	10.7				10/28	-1.4	6.1	0.0
MW-32-190	2/4	2.3	9.0	4/22	2.1	7.8	7/15	6.7	8.3				10/28	3.0	8.6	3.5
MW-32-59	2/4	6.8	9.8	4/22	-1.3	7.4	7/15	-2.0	6.6				10/28	-2.1	7.7	0.4
MW-32-85	2/4	6.5	10.4	4/22	3.7	9.8	7/15	0.3	7.0				10/28	6.4	5.8	4.2
MW-33				4/23	1.0	6.9										1.0
MW-35				4/23	0.6	8.0										0.6
MW-36-24	2/20	-1.6	6.9	5/1	-1.9	6.7	7/31	5.2	7.6				11/7	1.1	9.3	0.7
MW-36-41	2/20	-0.1	8.1	5/1	0.8	7.7	7/31	-0.1	10.6				11/7	-0.9	8.4	-0.1
MW-36-52	2/20	-0.9	7.1	5/1	-5.2	9.2	7/31	3.1	9.6				11/7	2.8	6.8	-0.1
MW-37-22	2/20	2.3	11.3	5/1	4.3	7.4	7/29	-4.9	9.4				11/7	-5.2	8.1	-0.9
MW-37-32	2/20	4.2	4.4	5/1	-2.7	7.9	7/29	-0.2	6.8				11/7	3.1	6.1	1.1
MW-37-40	2/20	-0.6	4.5	5/1	0.3	8.0	7/29	-2.8	7.1				11/7	0.9	5.6	-0.6
MW-37-57	2/20	-1.1	4.6	5/1	-4.6	7.8	7/29	1.0	8.3				11/7	-0.4	6.4	-1.3
MW-39-102				4/24	-2.2	9.7							10/29	-8.5	8.1	-5.4
MW-39-124				4/24	0.8	5.9							10/29	4.2	3.8	2.5
MW-39-183				4/24	1.2	6.7							10/29	2.4	7.5	1.8
MW-39-195				4/24	-1.9	5.3							10/29	1.6	5.9	-0.1
MW-39-67				4/24	0.5	6.6							10/29	0.4	6.0	0.5
MW-39-84				4/24	5.4	7.6							10/29	1.2	6.3	3.3
MW-40-100	3/13	3.1	9.5	5/7	3.3	8.6	7/26	-3.1	7.8				11/11	-1.8	7.5	0.4
MW-40-127	3/13	-4.0	9.4	5/7	2.5	9.2	7/26	0.3	7.5				11/11	3.6	7.0	0.6

Co-60 in Groundwater - 2013

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-40-162	3/13	-1.7	10.0	5/7	1.3	8.9	7/26	-4.1	9.8				11/11	-0.7	7.1	-1.3
MW-40-27	3/13	0.7	4.0	5/7	-0.7	5.9	7/26	6.4	8.1				11/11	-1.8	6.6	1.2
MW-40-46	3/13	4.0	9.7	5/7	-1.8	8.0	7/26	-0.5	7.1				11/11	0.3	6.9	0.5
MW-40-81	3/13	5.8	9.3	5/7	1.1	7.2	7/26	-7.1	7.8				11/11	1.7	4.2	0.4
MW-41-40	2/13	0.4	6.5	4/30	-1.9	7.0	7/22	-0.8	6.7				10/31	-2.6	5.8	-1.2
MW-41-63	2/13	-0.1	5.5	4/30	0.5	6.8	7/22	4.2	8.3				10/31	1.6	8.7	1.6
MW-42-49	2/12	-1.2	6.9	3/11	-1.2	6.3	4/29	0.9	6.9	7/18	-3.0	6.9	10/30	0.6	7.9	-0.8
MW-42-78	2/12	4.7	8.0	3/11	-17.1	12.2	4/29	1.1	7.7	7/18	0.0	6.9	10/30	-0.9	6.2	-2.4
MW-43-28	2/19	3.3	9.8	4/26	3.0	9.9	7/19	-2.5	7.9				10/31	3.1	5.8	1.7
MW-43-62	2/19	1.6	6.9	4/26	-2.4	10.3	7/24	-3.1	9.5				10/31	0.2	8.9	-0.9
MW-44-102	2/26	1.2	7.0	5/3	7.3	9.6	7/22	0.2	7.1				11/5	-0.8	6.5	2.0
MW-44-66	2/26	-0.2	7.8	5/3	1.2	6.7	7/23	-6.4	8.1				11/5	-0.2	6.2	-1.4
MW-45-42	2/13	1.5	5.6	4/30	-0.6	7.1	7/23	0.0	8.3				11/5	0.5	6.2	0.3
MW-45-61	2/13	-1.2	5.7	4/30	-3.6	8.0	7/22	-1.9	8.6				11/5	4.4	4.9	-0.6
MW-46	1/29	4.1	9.2	4/10	-0.7	8.5	7/30	3.9	9.9				11/8	-2.0	5.5	1.3
MW-47-56				4/26	1.8	6.9										1.8
MW-47-80				4/26	0.0	8.0										0.0
MW-49-26	1/30	3.2	5.4	4/11	0.8	7.8	7/17	3.9	8.9				10/24	2.2	6.0	2.5
MW-49-42	1/30	0.9	3.5	4/11	2.2	10.56	7/17	0.7	7.2				10/24	1.0	8.3	1.2
MW-49-65	1/30	-1.1	5.9	4/11	0.5	7.2	7/17	6.3	7.4				10/24	2.7	7.4	2.1
MW-50-42	2/11	-2.5	8.3	4/30	6.4	9.7	7/18	-7.8	10.2				10/24	-1.3	6.8	-1.3
MW-50-66	2/11	-3.4	7.8	4/30	1.2	8.9	7/18	-1.2	8.3				10/24	0.2	6.6	-0.8
MW-51-104	3/15	2.6	9.2	5/6	-4.4	9.8	7/25	-3.8	7.8				11/12	-1.4	7.3	-1.7
MW-51-135	3/15	6.2	9.7	5/6	1.6	7.7	7/25	0.3	9.0				11/12	-3.0	8.0	1.3
MW-51-163	3/15	1.1	9.7	5/6	0.4	10.0	7/25	0.7	6.4				11/12	-2.2	7.9	0.0
MW-51-189	3/15	2.8	6.2	5/6	1.8	8.3	7/25	-1.0	7.5				11/12	1.7	6.4	1.3
MW-51-40	3/15	1.1	7.4	5/6	5.3	7.6	7/25	-2.6	9.9				11/12	2.6	9.3	1.6
MW-51-79	3/15	-0.9	10.4	5/6	-1.1	7.5	7/25	4.0	7.4				11/12	2.4	9.7	1.1
MW-52-11				4/24	3.3	6.9										3.3
MW-52-122				4/18	2.0	10.0										2.0
MW-52-162				4/18	5.5	7.4										5.5
MW-52-18				4/18	-2.1	5.9										-2.1
MW-52-181				4/18	-3.3	9.1										-3.3

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-52-48				4/18	-5.0	7.7										-5.0
MW-52-64				4/18	-2.2	8.6										-2.2
MW-53-120	2/12	2.0	5.0	4/29	0.2	6.8	7/18	-2.2	9.0				10/30	0.0	6.5	0.0
MW-53-82	2/12	0.2	6.3	4/29	0.7	8.1	7/18	-2.6	8.5				10/30	-4.6	8.5	-1.5
MW-54-123	2/11	-7.7	11.7	4/12	-1.7	6.1	7/23	-0.1	10.7				11/1	3.7	7.6	-1.4
MW-54-144	2/11	3.3	8.5	4/12	0.6	8.8	7/23	-0.9	8.3				11/1	-0.9	8.6	0.5
MW-54-173	2/11	0.0	6.9	4/12	-0.5	10.2	7/23	-0.2	7.1				11/1	-1.8	7.0	-0.6
MW-54-190	2/11	-0.2	4.1	4/12	2.7	5.8	7/23	-0.2	8.0				11/1	1.8	9.2	1.0
MW-54-37	2/11	4.0	8.7	4/12	0.5	6.4	7/23	0.2	6.3				11/1	-0.5	11.0	1.1
MW-54-58	2/11	-4.2	9.3	4/12	-0.1	7.2	7/23	1.6	6.3				11/1	-1.9	6.8	-1.2
MW-55-24	2/6	-1.0	7.1	4/23	1.8	8.5	7/17	-1.9	8.2				12/12	-2.7	8.0	-0.9
MW-55-35	2/6	-5.3	9.2	4/23	0.5	5.2	7/17	2.2	7.7				12/12	1.9	10.6	-0.2
MW-55-54	2/6	0.5	6.9	4/23	2.2	5.4	7/17	-5.4	10.2				12/12	-0.4	8.6	-0.8
MW-56-53	3/11	1.1	3.6	4/29	1.0	6.8							11/4	-3.3	9.3	-0.4
MW-56-83	3/11	0.2	5.3	4/29	-3.9	9.2							11/4	-3.2	8.0	-2.3
MW-57-11				4/12	0.4	10.1										0.4
MW-57-20				4/12	2.2	8.2										2.2
MW-57-45				4/12	2.0	9.1										2.0
MW-58-26	2/14	-2.87	5.94	4/25	2.4	7.5							11/6	0.6	6.8	0.1
MW-58-65	2/14	5.54	7.23	4/25	0.1	8.8							11/6	-0.5	10.0	1.7
MW-60-135	2/7	-2.0	5.6	4/19	3.7	7.8	7/12	4.2	12.4				10/25	-1.0	5.5	1.2
MW-60-154	2/7	-2.9	6.8	4/19	5.7	8.5	7/12	-4.3	12.6				10/25	-1.1	5.7	-0.6
MW-60-176	2/7	-0.4	6.3	4/19	2.2	8.6	7/12	0.6	8.8				10/25	0.8	5.3	0.8
MW-60-35	2/7	-0.7	6.8	4/19	-3.2	8.2	7/12	1.9	9.5				10/25	3.1	6.7	0.3
MW-60-53	2/7	-0.9	5.6	4/19	1.6	8.0	7/12	-0.1	9.7				10/25	-2.4	6.1	-0.5
MW-60-72	2/7	2.0	3.4	4/19	1.1	7.5	7/12	2.6	8.1				10/25	2.2	7.3	2.0
MW-62-138	2/5	2.1	10.8	4/16	-2.0	8.9	7/11	2.4	8.0				10/22	0.0	7.3	0.6
MW-62-18	2/5	-2.9	7.7	4/16	-1.7	8.9	7/11	-2.2	10.0				10/22	-2.3	7.0	-2.3
MW-62-182	2/5	0.3	8.6	4/16	-3.5	8.3	7/11	1.7	7.7				10/22	-6.0	6.9	-1.9
MW-62-37	2/5	3.2	6.3	4/16	1.6	8.6	7/11	2.7	8.9				10/22	4.8	10.1	3.1
MW-62-53	2/5	1.5	9.3	4/16	-4.7	8.1	7/11	1.7	9.0				10/22	1.6	7.4	0.0
MW-62-71	2/5	2.3	6.6	4/16	-0.1	8.8	7/11	0.5	7.9				10/22	1.9	6.7	1.1
MW-62-92	2/5	-0.4	8.4	4/16	1.1	6.2	7/11	2.8	7.3				10/22	-0.5	8.1	0.7

Co-60 in Groundwater - 2013

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-63-112	1/31	2.7	9.6	4/15	-2.1	6.8	7/10	-3.8	7.4				10/21	-0.4	8.3	-0.9
MW-63-121	1/31	-0.3	7.9	4/15	1.9	7.1	7/10	2.2	5.9				10/21	-1.3	6.7	0.6
MW-63-163	1/31	-1.7	8.3	4/15	0.4	7.2	7/10	-0.4	6.4				10/21	0.0	6.9	-0.4
MW-63-174	1/31	-3.7	8.0	4/15	-5.5	8.2	7/10	2.5	7.7				10/21	-2.7	7.9	-2.4
MW-63-18	1/31	1.2	6.6	4/15	2.7	7.6	7/10	0.0	8.7				10/21	4.5	7.6	2.1
MW-63-34	1/31	-2.5	7.0	4/15	-2.1	7.7	7/10	2.4	7.9				10/21	0.4	5.5	-0.5
MW-63-50	1/31	-4.7	10.4	4/15	0.1	5.9	7/10	7.6	7.3				10/21	3.1	7.6	1.6
MW-63-93	1/31	0.1	7.5	4/15	-0.1	8.3	7/10	-1.6	9.1				10/21	4.0	7.2	0.6
MW-66-21	2/22	-1.9	3.5	4/17	3.0	8.3	7/16	1.7	7.6				10/23	0.7	6.3	0.9
MW-66-36	2/22	1.7	9.6	4/17	-3.6	7.8	7/16	1.1	9.7				10/23	1.5	9.5	0.2
MW-67-105	3/5	3.4	7.6	4/17	-1.6	11.3	7/16	-0.6	9.5				10/23	0.1	6.9	0.3
MW-67-173	3/5	0.1	7.5	4/17	1.3	9.5	7/16	-0.9	10.4				10/23	2.8	5.6	0.8
MW-67-219	3/5	3.8	7.2	4/17	2.3	8.4	7/16	-1.4	11.0				10/23	1.5	8.2	1.5
MW-67-276	3/5	0.5	7.7	4/17	0.9	7.6	7/16	-2.5	7.2				10/23	-1.0	7.3	-0.5
MW-67-323	3/5	-3.4	9.6	4/17	1.2	8.3	7/16	5.3	9.4				10/23	1.6	7.5	1.1
MW-67-340	3/5	3.9	12.1	4/17	2.0	9.1	7/16	0.3	7.1				10/23	-1.7	8.0	1.1
MW-67-39	3/5	-1.6	4.1	4/17	-1.1	7.7	7/16	-1.6	9.7				10/23	-2.8	6.4	-1.7
MW-68-103	3/4	-0.958	4.86	4/25	1.5	7.7	7/9	1.1	6.1							0.6
MW-68-132	3/4	0.887	6.18	4/25	0.1	7.6	7/9	4.7	8.3							1.9
MW-68-19	3/4	1.23	3.81	4/25	-3.5	9.6	7/9	-5.2	13.0							-2.5
MW-68-29	3/4	0.89	3.57	4/25	-3.0	6.7	7/9	0.4	8.0							-0.5
MW-68-57	3/4	0.772	7.62	4/25	-0.1	10.2	7/9	-4.2	8.1							-1.2
CSS				4/23	-4.2	8.3							11/6	1.9	7.1	-1.1
NCD	2/18	0.0	7.7	4/1	6.4	8.9	6/24	0.3	8.1	9/9	4.7	6.1	12/9	0.6	8.1	2.4
SFDS	2/20	2.9	10.6	4/3	0.1	6.4	6/26	-2.11	4.47	9/11	1.9	5.7	12/11	3.3	7.3	1.2
U3-4D	2/14	-2.0	7.6	4/26	0.9	7.4	7/19	0.846	8.34				10/16	0.0	7.6	-0.1
U3-4S	2/14	-1.2	8.4	4/26	1.2	8.7	7/19	1.5	10.4				10/16	-2.2	7.7	-0.2
U3-T1	2/19	1.9	7.0	5/8	0.7	7.6	7/19	-1.0	8.8				11/6	0.3	6.9	0.5
U3-T2	2/19	2.7	6.1	5/8	1.9	9.3	7/19	-0.6	6.8				11/6	3.8	10.1	1.9

Co-60 in Groundwater - 2013

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
B-1	times per quarter; no water available for samples															
B-6	1/29	5.3	10.1	4/10	6.6	7.9				7/9	3.3	8.8	10/16	2.7	10.9	4.4
I-2	2/6	1.5	7.8	4/24	-0.8	9.6				7/31	-3.1	7.3	11/4	-3.1	7.5	-1.4
MH-5	1/30	5.7	6.7	4/11	4.3	7.8				7/12	2.9	8.3	10/24	3.7	7.9	4.1
MW-107				5/6	0.0	30.9										0.0
MW-111				4/23	-2.9	6.5							12/12	0.2	6.8	-1.3
MW-30-69	2/21	0.9	9.4	5/2	7.8	13.7				8/30	0.9	4.9	12/4	5.0	9.5	3.6
MW-30-84	2/21	1.7	6.5	5/2	0.4	15.7				8/30	0.0	11.0	12/4	-0.9	6.8	0.3
MW-31-49	2/4	-0.4	8.0	4/22	3.6	5.6				7/15	-2.3	9.3	10/28	0.2	5.6	0.3
MW-31-63	2/4	3.2	9.2	4/22	0.7	8.8				7/15	0.4	7.1	10/28	1.7	8.6	1.5
MW-31-85	2/4	2.5	7.0	4/22	-2.2	8.4				7/15	-8.1	7.9	10/28	6.1	12.1	-0.4
MW-32-149	2/4	-2.8	7.0	4/22	-0.6	6.3				7/15	-0.6	8.6	10/28	5.0	6.3	0.2
MW-32-173	2/4	2.1	10.9	4/22	0.8	12.9				7/15	-2.0	7.9	10/28	-2.8	10.1	-0.5
MW-32-190	2/4	-2.7	8.6	4/22	3.3	7.5				7/15	-2.3	8.0	10/28	7.3	9.7	1.4
MW-32-59	2/4	0.0	8.0	4/22	1.6	8.0				7/15	-6.6	8.9	10/28	2.2	6.9	-0.7
MW-32-85	2/4	-0.1	7.4	4/22	5.2	11.4				7/15	-1.8	6.8	10/28	2.8	11.7	1.5
MW-33				4/23	-1.1	6.7										-1.1
MW-35				4/23	-1.0	8.1										-1.0
MW-36-24	2/20	2.5	7.4	5/1	0.7	7.6				7/31	-2.3	7.3	11/7	-1.3	8.1	-0.1
MW-36-41	2/20	3.6	7.2	5/1	4.2	6.9				7/31	-1.1	9.2	11/7	3.2	6.8	2.5
MW-36-52	2/20	3.9	13.1	5/1	14.1	13.2				7/31	2.3	7.5	11/7	-1.0	6.7	4.8
MW-37-22	2/20	3.2	9.6	5/1	-0.9	8.8				7/29	-1.2	8.5	11/7	0.0	14.5	0.3
MW-37-32	2/20	-0.3	6.3	5/1	3.7	9.9				7/29	-1.3	7.9	11/7	2.0	5.5	1.0
MW-37-40	2/20	1.5	4.7	5/1	0.1	9.2				7/29	-2.6	9.8	11/7	-1.5	6.5	-0.6
MW-37-57	2/20	-0.2	4.8	5/1	20.7	10.8				7/29	-1.6	7.5	11/7	0.5	8.2	4.8
MW-39-102				4/24	1.2	7.4							10/29	-1.6	8.8	-0.2
MW-39-124				4/24	0.7	5.7							10/29	-0.8	8.3	0.0
MW-39-183				4/24	-0.3	6.6							10/29	2.7	7.2	1.2
MW-39-195				4/24	-0.7	5.2							10/29	2.1	6.1	0.7
MW-39-67				4/24	6.7	13.8							10/29	1.5	5.7	4.1
MW-39-84				4/24	3.8	8.3							10/29	-0.1	8.2	1.9
MW-40-100	3/13	0.0	9.5	5/7	3.1	7.6				7/26	4.5	6.3	11/11	0.0	8.7	1.9
MW-40-127	3/13	7.2	10.9	5/7	5.4	14.5				7/26	2.8	8.9	11/11	0.0	7.2	3.9
MW-40-162	3/13	-2.1	11.3	5/7	0.1	9.3				7/26	6.6	10.0	11/11	0.9	6.3	1.4

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-40-27	3/13	1.4	4.4	5/7	-2.3	7.3				7/26	8.5	12.0	11/11	-3.4	8.3	1.0
MW-40-46	3/13	8.8	10.4	5/7	2.0	7.1				7/26	-1.2	9.5	11/11	-2.9	6.8	1.7
MW-40-81	3/13	4.9	9.4	5/7	2.6	7.4				7/26	-1.6	7.1	11/11	0.3	7.7	1.6
MW-41-40	2/13	1.2	6.8	4/30	0.7	6.8				7/22	0.4	8.3	10/31	-0.4	5.8	0.5
MW-41-63	2/13	-1.9	6.1	4/30	-1.4	7.3				7/22	-3.7	8.6	10/31	0.8	17.1	-1.6
MW-42-49	2/12	291000	981	3/11	259000	528	4/29	141000	654	7/18	36500	381.0	10/30	53200	393	156140
MW-42-78	2/12	-0.6	6.0	3/11	-0.2	8.3	4/29	-0.9	7.5	7/18	-0.7	7.4	10/30	1.6	7.0	-0.2
MW-43-28	2/19	2.1	7.6	4/26	-5.3	9.2				7/19	3.3	7.4	10/31	0.0	7.0	0.0
MW-43-62	2/19	0.5	6.0	4/26	-5.0	11.1				7/24	2.2	9.6	10/31	1.7	9.8	-0.1
MW-44-102	2/26	2.0	6.5	5/3	-3.2	7.1				7/22	0.1	10.3	11/5	0.0	8.4	-0.3
MW-44-66	2/26	-0.9	7.8	5/3	1.3	12.9				7/23	-2.3	7.2	11/5	5.5	7.6	0.9
MW-45-42	2/13	3.7	6.7	4/30	2.8	8.0				7/23	-2.1	7.4	11/5	-1.1	6.1	0.8
MW-45-61	2/13	1.2	5.1	4/30	0.9	9.3				7/22	1.2	8.3	11/5	3.7	10.1	1.7
MW-46	1/29	0.7	7.5	4/10	5.0	9.8				7/30	6.3	8.5	11/8	1.4	6.0	3.4
MW-47-56				4/26	0.6	7.5										0.6
MW-47-80				4/26	0.7	6.8										0.7
MW-49-26	1/30	1.2	4.9	4/11	-1.7	8.0				7/17	1.8	8.3	10/24	-6.1	8.0	-1.2
MW-49-42	1/30	-0.7	5.3	4/11	10.0	10.6				7/17	-2.5	10.8	10/24	2.1	9.6	2.2
MW-49-65	1/30	5.2	9.3	4/11	2.3	6.3				7/17	-1.1	6.6	10/24	-0.3	7.4	1.5
MW-50-42	2/11	1.6	8.1	4/30	0.1	11.5				7/18	2.6	12.1	10/24	3.2	4.9	1.9
MW-50-66	2/11	0.1	7.9	4/30	-0.6	5.9				7/18	1.3	9.8	10/24	4.3	9.8	1.3
MW-51-104	3/15	4.2	8.2	5/6	3.5	6.8				7/25	3.1	8.1	11/12	0.0	8.8	2.7
MW-51-135	3/15	-4.1	12.3	5/6	6.8	12.0				7/25	1.7	8.9	11/12	1.7	7.4	1.5
MW-51-163	3/15	2.7	13.9	5/6	-0.4	9.7				7/25	-3.1	9.6	11/12	0.9	7.0	0.0
MW-51-189	3/15	5.8	14.9	5/6	-1.4	6.9				7/25	-3.6	7.5	11/12	1.0	6.3	0.5
MW-51-40	3/15	0.7	11.2	5/6	-2.1	8.3				7/25	-2.5	7.7	11/12	2.2	8.1	-0.4
MW-51-79	3/15	7.9	12.3	5/6	-1.6	7.3				7/25	2.2	6.6	11/12	-1.2	9.3	1.8
MW-52-11				4/24	7.2	8.4										7.2
MW-52-122				4/18	-4.4	10.5										-4.4
MW-52-162				4/18	-2.9	7.2										-2.9
MW-52-18				4/18	-0.9	7.5										-0.9
MW-52-181				4/18	6.0	11.0										6.0
MW-52-48				4/18	-2.5	8.8										-2.5
MW-52-64				4/18	2.4	7.5										2.4

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-53-120	2/12	0.3	5.1	4/29	1.6	5.5				7/18	-0.9	7.6	10/30	2.9	6.6	1.0
MW-53-82	2/12	5.3	6.8	4/29	8.5	9.8				7/18	4.1	11.2	10/30	2.2	7.8	5.0
MW-54-123	2/11	-4.3	7.5	4/12	6.1	8.9				7/23	4.2	10.7	11/1	2.0	7.7	2.0
MW-54-144	2/11	0.2	8.5	4/12	1.8	7.4				7/23	1.6	9.4	11/1	-1.0	8.0	0.7
MW-54-173	2/11	-1.2	7.3	4/12	1.4	7.2				7/23	-2.0	11.3	11/1	-0.9	7.1	-0.7
MW-54-190	2/11	0.0	3.6	4/12	2.1	6.3				7/23	6.1	8.9	11/1	1.0	6.8	2.3
MW-54-37	2/11	-0.5	8.7	4/12	1.2	6.6				7/23	-5.9	9.7	11/1	0.0	16.9	-1.3
MW-54-58	2/11	-3.6	9.7	4/12	-4.3	8.3				7/23	-7.7	9.3	11/1	-2.9	8.8	-4.6
MW-55-24	2/6	5.1	9.5	4/23	-3.3	7.1				7/17	2.8	8.9	12/12	4.6	7.6	2.3
MW-55-35	2/6	-2.4	9.2	4/23	2.0	7.7				7/17	0.0	7.1	12/12	-4.1	9.2	-1.1
MW-55-54	2/6	5.0	12.5	4/23	0.5	4.8				7/17	0.0	10.6	12/12	-1.2	8.6	1.1
MW-56-53	3/11	-3.5	4.8	4/29	-0.6	5.9							11/4	-3.2	11.1	-2.4
MW-56-83	3/11	-1.6	5.3	4/29	-0.8	7.1							11/4	-9.7	9.9	-4.0
MW-57-11				4/12	0.0	10.2										0.0
MW-57-20				4/12	0.4	6.8										0.4
MW-57-45				4/12	-0.4	7.7										-0.4
MW-58-26	2/14	1.8	8.4	4/25	-1.5	7.1							11/6	0.6	6.3	0.3
MW-58-65	2/14	1.4	6.0	4/25	-4.4	9.8							11/6	1.4	10.3	-0.6
MW-60-135	2/7	1.0	6.3	4/19	1.3	7.5				7/12	0.1	7.1	10/25	-1.9	5.7	0.1
MW-60-154	2/7	-0.3	7.7	4/19	-3.8	8.1				7/12	-1.8	10.4	10/25	-1.2	4.8	-1.8
MW-60-176	2/7	2.4	5.8	4/19	0.0	7.5				7/12	1.7	8.4	10/25	2.9	5.1	1.8
MW-60-35	2/7	3.7	4.7	4/19	1.7	8.3				7/12	2.8	6.8	10/25	1.7	7.5	2.5
MW-60-53	2/7	-3.2	6.3	4/19	-4.8	9.7				7/12	0.1	8.1	10/25	-0.6	5.0	-2.1
MW-60-72	2/7	0.3	5.4	4/19	6.5	10.3				7/12	2.0	10.1	10/25	1.1	5.7	2.5
MW-62-138	2/5	3.7	9.9	4/16	5.7	11.2				7/11	5.5	8.3	10/22	3.5	7.2	4.6
MW-62-18	2/5	2.1	7.6	4/16	-3.4	6.2				7/11	-2.4	10.6	10/22	-7.0	8.3	-2.7
MW-62-182	2/5	1.0	8.0	4/16	0.2	8.2				7/11	1.8	9.9	10/22	3.3	8.6	1.6
MW-62-37	2/5	-3.1	9.2	4/16	2.6	10.4				7/11	1.0	10.7	10/22	-1.8	8.0	-0.3
MW-62-53	2/5	0.2	7.0	4/16	-1.1	10.6				7/11	0.5	8.2	10/22	0.8	6.6	0.1
MW-62-71	2/5	-4.4	7.4	4/16	5.3	8.3				7/11	0.4	6.7	10/22	-0.2	7.8	0.3
MW-62-92	2/5	3.0	8.3	4/16	-5.1	6.3				7/11	2.7	14.1	10/22	-1.1	10.7	-0.1
MW-63-112	1/31	1.5	8.5	4/15	0.8	12.0				7/10	-0.1	7.9	10/21	3.8	4.4	1.5
MW-63-121	1/31	2.6	7.5	4/15	-0.9	6.5				7/10	-0.5	6.5	10/21	3.0	10.6	1.1
MW-63-163	1/31	0.9	8.8	4/15	-3.5	9.5				7/10	0.6	6.8	10/21	-0.3	6.0	-0.6

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-63-174	1/31	-2.0	7.9	4/15	1.6	8.4				7/10	-0.3	7.4	10/21	-1.1	7.4	-0.4
MW-63-18	1/31	-0.9	9.1	4/15	-3.3	10.8				7/10	-1.3	9.0	10/21	1.2	7.0	-1.1
MW-63-34	1/31	3.1	6.8	4/15	7.6	10.9				7/10	-0.6	7.9	10/21	-1.5	7.5	2.1
MW-63-50	1/31	0.5	6.9	4/15	-0.2	7.8				7/10	3.4	12.1	10/21	-4.5	8.9	-0.2
MW-63-93	1/31	1.6	7.7	4/15	0.4	7.3				7/10	0.1	9.5	10/21	1.3	7.4	0.8
MW-66-21	2/22	1.9	7.2	4/17	1.2	6.9				7/16	-0.8	9.4	10/23	4.1	7.1	1.6
MW-66-36	2/22	0.7	3.3	4/17	8.0	8.8				7/16	0.0	8.8	10/23	-4.7	8.4	1.0
MW-67-105	3/5	6.6	9.4	4/17	-0.8	12.1				7/16	-3.2	9.1	10/23	-0.6	7.2	0.5
MW-67-173	3/5	0.6	7.9	4/17	-0.7	8.6				7/16	2.8	8.0	10/23	-1.8	5.6	0.2
MW-67-219	3/5	7.7	7.9	4/17	2.5	10.1				7/16	-5.2	9.1	10/23	2.9	8.9	2.0
MW-67-276	3/5	-1.7	7.6	4/17	1.9	6.8				7/16	-1.2	9.0	10/23	-0.8	8.1	-0.5
MW-67-323	3/5	-4.2	8.2	4/17	1.6	7.2				7/16	-0.2	8.8	10/23	4.1	7.3	0.3
MW-67-340	3/5	-6.1	9.5	4/17	4.7	9.9				7/16	-1.1	6.5	10/23	3.1	9.7	0.2
MW-67-39	3/5	1.6	3.8	4/17	6.0	9.8				7/16	1.7	7.8	10/23	4.1	10.1	3.4
MW-68-103	3/4	-3.2	5.8	4/25	4.2	8.3				7/9	5.2	8.0				2.1
MW-68-132	3/4	-3.8	7.2	4/25	-5.1	9.8				7/9	-3.7	8.3				-4.2
MW-68-19	3/4	0.2	3.7	4/25	2.4	8.2				7/9	4.2	10.8				2.3
MW-68-29	3/4	-2.8	3.7	4/25	0.7	11.6				7/9	-2.0	7.1				-1.3
MW-68-57	3/4	2.0	4.7	4/25	-5.1	10.5				7/9	-0.3	7.1				-1.1
CSS				4/23	5.4	6.2							11/6	3.9	7.6	4.6
NCD	2/18	22000	199	4/1	20900	254	6/24	13200	106	9/9	12700	150	12/9	11700	180	16100
SFDS	2/20	6.7	9.4	4/3	5.5	7.5	6/26	6.4	5.5	9/11	5.8	7.0	12/11	2.3	8.4	5.3
U3-4D	2/14	0.7	7.5	4/26	2.2	8.3				7/19	1.6	9.0	10/16	5.1	7.1	2.4
U3-4S	2/14	1.0	8.4	4/26	-1.7	10.2				7/19	4.9	9.8	10/16	-0.8	6.7	0.8
U3-T1	2/19	-0.5	5.8	5/8	1.1	7.2				7/19	0.4	7.0	11/6	1.0	6.9	0.5
U3-T2	2/19	-6.3	7.1	5/8	0.9	9.2				7/19	-2.3	9.7	11/6	1.8	8.6	-1.5

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
B-1	times per quarter; no water available for samples															
B-6	1/29	229	369	4/10	-42	363				7/9	233	321	10/16	82	354	125
I-2	2/6	99	351	4/24	-186	342				7/31	28	288	11/4	60	354	0
MH-5	1/30	1080	450	4/11	747	432				7/12	1270	429	11/11	103	396	800
MW-107				5/6	48	324										48
MW-111				4/23	901	429							12/12	2870	594	1886
MW-30-69	2/21	75500	2480	5/2	70300	2420				8/30	57000	2210	12/4	54600	2080	64350
MW-30-84	2/21	6220	786	5/2	6200	774				8/30	5030	756	12/4	4660	672	5528
MW-31-49	2/4	807	426	4/22	18100	1340				7/15	18500	1230	10/28	11800	1020	12302
MW-31-63	2/4	20000	1270	4/22	15100	1160				7/15	11700	1010	10/28	33200	1770	20000
MW-31-85	2/4	4480	666	4/22	4060	675				7/15	3160	609	10/28	2460	564	3540
MW-32-149	2/4	228	366	4/22	312	375				7/15	-123	369	10/28	230	378	162
MW-32-173	2/4	301	372	4/22	330	375				7/15	33	390	10/28	228	384	223
MW-32-190	2/4	1230	462	4/22	1260	477				7/15	808	450	10/28	1220	465	1130
MW-32-59	2/4	10300	930	4/22	27800	1650				7/15	35300	1680	10/28	20300	1310	23425
MW-32-85	2/4	11100	1070	4/22	9150	984				7/15	9150	906	10/28	7440	828	9210
MW-33				4/23	3490	672										3490
MW-35				4/23	831	456										831
MW-36-24	2/20	207	390	5/1	-56	420				7/31	170	393	11/7	3	354	81
MW-36-41	2/20	5410	735	5/1	4940	789				7/31	3780	654	11/7	4030	660	4540
MW-36-52	2/20	3900	657	5/1	3420	684				7/31	4410	690	11/7	4440	690	4043
MW-37-22	2/20	3150	615	5/1	2830	648				7/29	1820	528	11/7	1150	444	2238
MW-37-32	2/20	3470	648	5/1	2320	624				7/29	1700	531	11/7	1530	492	2255
MW-37-40	2/20	5150	747	5/1	4440	753				7/29	3260	627	11/7	3240	612	4023
MW-37-57	2/20	4740	708	5/1	3960	717				7/29	3490	639	11/7	3300	615	3873
MW-39-102				4/24	150	351							10/29	73	363	112
MW-39-124				4/24	370	387							10/29	68	360	219
MW-39-183				4/24	143	375							10/29	-85	342	29
MW-39-195				4/24	340	384							10/29	904	381	622
MW-39-67				4/24	321	390							10/29	254	378	288
MW-39-84				4/24	208	384							10/29	-144	375	32
MW-40-100	3/13	-55	342	5/7	108	357				7/26	41	384	11/11	210	321	76
MW-40-127	3/13	44	354	5/7	50	348				7/27	132	396	11/11	106	393	83
MW-40-162	3/13	18	351	5/7	66	348				7/28	231	405	11/11	260	324	144

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-40-27	3/13	65	363	5/7	265	354				7/29	33	381	11/11	270	327	158
MW-40-46	3/13	145	363	5/7	151	339				7/30	-134	375	11/11	301	321	116
MW-40-81	3/13	-2	324	5/7	263	351				7/31	50	393	11/11	282	333	148
MW-41-40	2/13	452	402	4/30	1540	510				8/1	916	477	10/31	1920	576	1207
MW-41-63	2/13	367	393	4/30	566	408				8/2	616	441	10/31	612	354	540
MW-42-49	2/12	663	423	3/11	441	396	4/29	478	369	8/3	442	468	10/30	2180	528	841
MW-42-78	2/12	311	378	3/11	297	411	4/29	266	375	8/4	425	462	10/30	424	441	345
MW-43-28	2/19	164	369	4/26	206	447				8/5	242	408	10/31	333	414	236
MW-43-62	2/19	53	354	4/26	235	372				8/6	268	405	10/31	129	393	171
MW-44-102	2/26	432	405	5/3	543	393				8/7	561	441	11/5	646	363	546
MW-44-66	2/26	181	366	5/3	372	375				8/8	163	414	11/5	422	423	285
MW-45-42	2/13	7270	825	4/30	6360	858				8/9	2600	513	11/5	976	480	4302
MW-45-61	2/13	1670	501	4/30	1650	570				8/10	597	366	11/5	401	345	1080
MW-46	1/29	2030	516	4/10	2560	570				8/11	2030	573	11/8	1910	471	2133
MW-47-56				4/26	1200	534										1200
MW-47-80				4/26	8970	978										8970
MW-49-26	1/30	4080	708	4/11	3860	678				7/17	3770	690	10/24	3120	573	3708
MW-49-42	1/30	6320	843	4/11	5050	759				7/17	4800	762	10/24	4210	645	5095
MW-49-65	1/30	5660	813	4/11	5210	780				7/17	5240	792	10/24	4300	642	5103
MW-50-42	2/11	847	432	4/30	282	372				7/18	252	408	10/24	112	414	373
MW-50-66	2/11	5600	729	4/30	5390	804				7/18	4360	729	10/24	3540	681	4723
MW-51-104	3/15	77	333	5/6	-8	342				7/25	221	405	11/12	-200	390	22
MW-51-135	3/15	30	333	5/6	-58	336				7/25	334	420	11/12	99	417	101
MW-51-163	3/15	83	324	5/6	-83	333				7/25	305	429	11/12	-325	378	-5
MW-51-189	3/15	65	330	5/6	-50	339				7/25	284	411	11/12	-250	387	12
MW-51-40	3/15	130	339	5/6	75	351				7/25	273	411	11/12	-19	408	115
MW-51-79	3/15	76	333	5/6	-48	327				7/25	228	399	11/12	-294	375	-9
MW-52-11				4/24	363	381										363
MW-52-122				4/18	192	363										192
MW-52-162				4/18	439	387										439
MW-52-18				4/18	252	363										252
MW-52-181				4/18	276	369										276
MW-52-48				4/18	319	381										319
MW-52-64				4/18	85	342										85

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-53-120	2/12	7000	807	4/29	7570	918				7/18	6650	867	10/30	5540	786	6690
MW-53-82	2/12	686	417	4/29	862	516				7/18	1040	486	10/30	2260	597	1212
MW-54-123	2/11	8170	870	4/12	7340	891				7/23	8340	951	11/1	6960	858	7703
MW-54-144	2/11	7250	837	4/12	5820	813				7/23	6250	846	11/1	5180	759	6125
MW-54-173	2/11	5420	735	4/12	5900	771				7/23	6180	840	11/1	5250	774	5688
MW-54-190	2/11	8750	912	4/12	7570	852				7/23	5980	822	11/1	4310	717	6653
MW-54-37	2/11	7200	825	4/12	6160	831				7/23	6210	840	11/1	5840	801	6353
MW-54-58	2/11	7530	840	4/12	7130	882				7/23	7860	918	11/1	7010	861	7383
MW-55-24	2/6	1490	477	4/23	1380	510				7/17	1310	516	12/12	1070	417	1313
MW-55-35	2/6	1170	438	4/23	1560	534				7/17	1240	507	12/12	1260	435	1308
MW-55-54	2/6	6140	762	4/23	5100	798				7/17	4870	768	12/12	4900	684	5253
MW-56-53	3/11	836	438	4/29	2560	600							11/4	1160	510	1519
MW-56-83	3/11	7570	834	4/29	6530	879							11/4	3510	681	5870
MW-57-11				4/12	3320	666										3320
MW-57-20				4/12	4740	753										4740
MW-57-45				4/12	5020	765										5020
MW-58-26	2/14	928	447	4/25	1440	501							11/6	312	429	893
MW-58-65	2/14	1730	507	4/25	1540	531							11/6	1040	504	1437
MW-60-135	2/7	161	378	4/19	-76	351				7/12	371	417	10/25	358	384	203
MW-60-154	2/7	477	399	4/19	500	399				7/12	749	459	10/25	427	387	538
MW-60-176	2/7	1200	474	4/19	1060	459				7/12	1080	492	10/25	1190	468	1133
MW-60-35	2/7	240	378	4/19	188	378				7/12	324	417	10/25	6	369	190
MW-60-53	2/7	108	366	4/19	-167	345				7/12	251	405	10/25	61	375	63
MW-60-72	2/7	166	372	4/19	-42	363				7/12	-92	372	10/25	261	366	73
MW-62-138	2/5	4110	660	4/16	3790	648				7/11	3100	573	10/22	2930	654	3483
MW-62-18	2/5	326	378	4/16	207	381				7/11	-15	354	10/22	362	396	220
MW-62-182	2/5	821	429	4/16	921	450				7/11	1290	459	10/22	1650	540	1171
MW-62-37	2/5	356	387	4/16	426	396				7/11	406	384	10/22	615	429	451
MW-62-53	2/5	478	396	4/16	569	420				7/11	823	426	10/22	984	474	714
MW-62-71	2/5	1340	471	4/16	1790	522				7/11	1890	498	10/22	1950	561	1743
MW-62-92	2/5	1340	465	4/16	1700	504				7/11	1730	486	10/22	1990	573	1690
MW-63-112	1/31	1890	546	4/15	1280	450				7/10	1270	453	10/21	1520	534	1490
MW-63-121	1/31	2820	609	4/15	2430	534				7/10	2460	537	10/21	1980	570	2423
MW-63-163	1/31	583	402	4/15	642	411				7/10	1080	441	10/21	885	462	798

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-63-174	1/31	966	456	4/15	912	441				7/10	1220	450	10/21	986	480	1021
MW-63-18	1/31	331	387	4/15	186	375				7/10	325	375	10/21	344	405	297
MW-63-34	1/31	310	384	4/15	170	369				7/10	375	381	10/21	247	372	276
MW-63-50	1/31	418	387	4/15	202	378				7/10	416	387	10/21	523	423	390
MW-63-93	1/31	738	405	4/15	448	387				7/10	732	411	10/21	673	432	648
MW-66-21	2/22	-16	363	4/17	162	345				7/16	148	360	10/23	453	447	187
MW-66-36	2/22	2300	537	4/17	2020	528				7/16	1950	504	10/23	1160	525	1858
MW-67-105	3/5	3190	603	4/17	2460	564				7/16	3210	573	10/23	3000	657	2965
MW-67-173	3/5	479	363	4/17	658	426				7/16	582	354	10/23	640	411	590
MW-67-219	3/5	1030	453	4/17	979	447				7/16	958	399	10/23	1140	453	1027
MW-67-276	3/5	929	465	4/17	766	435				7/16	965	396	10/23	860	426	880
MW-67-323	3/5	317	405	4/17	261	393				7/16	557	366	10/23	428	390	391
MW-67-340	3/5	608	435	4/17	470	411				7/16	515	357	10/23	408	384	500
MW-67-39	3/5	1540	483	4/17	1070	462				7/16	863	423	10/23	1210	495	1171
MW-68-103	3/4	1440	507	4/25	1990	555				7/9	2590	534				2007
MW-68-132	3/4	1760	519	4/25	2300	597				7/9	2700	543				2253
MW-68-19	3/4	7520	831	4/25	3910	699				7/9	5540	720				5657
MW-68-29	3/4	13100	1050	4/25	12300	1150				7/9	7610	816				11003
MW-68-57	3/4	5870	771	4/25	8020	939				7/9	7590	816				7160
CSS				4/23	1850	534							11/6	5200	780	3525
NCD	2/18	1520	669	4/1	2660	600	6/24	1380	528	9/9	3120	645	12/9	3250	591	2386
SFDS	2/20	159	390	4/3	-42	360	6/26	588	351	9/11	529	456	12/11	190	360	285
U3-4D	2/14	643	426	4/26	1010	468				7/19	1080	414	10/16	1370	474	1026
U3-4S	2/14	783	426	4/26	1060	477				7/19	1140	417	10/16	1800	510	1196
U3-T1	2/19	1890	525	5/8	2780	627				7/19	2130	498	11/6	2990	591	2448
U3-T2	2/19	4350	666	5/8	5850	828				7/19	3940	621	11/6	2290	588	4108

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-42-49	2/12	1880	63	3/11	1330.0	51.0	4/29	654.0	40.8	7/18	343.0	28.2	10/30	518.0	38.4	945
MW-42-78	2/12	-4.7	17.9	3/11	3.9	19.7	4/29	8.6	15.1	7/18	0.0	17.5	10/30	11.1	13.8	4
MW-49-26	1/30	1.2	18.9	4/11	15.7	17.0				7/17	8.9	18.8	10/24	8.8	13.2	9
MW-49-42	1/30	1.5	18.8	4/11	7.7	18.4				7/17	-0.4	16.1	10/24	4.5	12.9	3
MW-49-65	1/30	0.0	17.4	4/11	1.6	14.8				7/17	3.8	18.2	10/24	8.6	13.1	4
MW-50-42	2/11	-4.5	18.2	4/30	6.8	16.4				7/18	3.3	19.3	10/24	5.8	12.8	3
MW-50-66	2/11	5.2	18.8	4/30	9.1	16.8				7/18	1.5	16.2	10/24	5.4	13.1	5
MW-53-120	2/12	8.9	19.9	4/29	10.1	16.8				7/18	9.4	16.6	10/30	2.3	16.5	8
MW-53-82	2/12	7.4	18.8	4/29	18.7	20.8				7/18	-2.8	16.1	10/30	1.3	12.9	6
MW-54-123	2/11	0.5	14.9	4/12	10.5	15.0				7/23	7.7	17.9	11/1	8.0	13.8	7
MW-54-144	2/11	-2.6	18.7	4/12	9.6	16.6				7/23	-1.5	15.7	11/1	0.0	13.4	1
MW-54-173	2/11	5.5	14.0	4/12	2.7	16.1				7/23	4.7	16.8	11/1	-2.8	13.4	3
MW-54-190	2/11	7.5	19.7	4/12	1.0	16.9				7/23	7.0	16.8	11/1	3.0	14.8	5
MW-54-37	2/11	0.5	14.1	4/12	0.0	12.2				7/23	8.1	16.5	11/1	6.5	13.2	4
MW-54-58	2/11	-3.7	13.8	4/12	-4.4	15.2				7/23	-3.2	16.4	11/1	5.4	13.1	-1
MW-55-24	2/6	-8.6	17.0	4/23	-5.3	16.4				7/17	4.0	18.3	12/12	12.2	18.6	1
MW-55-35	2/6	2.9	17.9	4/23	-1.3	15.9				7/17	-1.0	18.9	12/12	-2.3	18.6	0
MW-55-54	2/6	-9.6	16.9	4/23	2.4	16.5				7/17	2.2	17.8	12/12	4.4	18.5	0
MW-57-11				4/12	0.6	15.4										1
MW-57-20				4/12	-8.0	15.2										-8
MW-57-45				4/12	-9.9	15.8										-10
MW-60-53	2/7	9.7	20.6	4/19	5.9	16.8				7/12	0.8	19.0	10/25	8.8	18.1	6
MW-66-21	2/22	0.1	14.3	4/17	-8.1	15.5				7/16	0.0	18.1	10/23	1.4	20.3	-2
MW-66-36	2/22	4.5	17.9	4/17	-4.7	15.1				7/16	-3.1	17.2	10/23	1.2	13.4	-1
MW-67-105	3/5	-1.9	14.3	4/17	-1.1	15.7				7/16	8.3	17.6	10/23	1.5	13.4	2
MW-67-173	3/5	-3.5	14.1	4/17	-2.3	12.7				7/16	6.2	15.8	10/23	0.8	14.5	0
MW-67-219	3/5	3.2	16.6	4/17	3.7	16.3				7/16	-2.4	16.9	10/23	7.7	16.2	3
MW-67-276	3/5	5.4	19.4	4/17	10.4	15.6				7/16	4.5	18.8	10/23	3.0	15.7	6
MW-67-323	3/5	10.3	18.3	4/17	-2.1	20.3				7/16	-0.8	14.0	10/23	12.1	15.6	5
MW-67-340	3/5	10.5	19.1	4/17	-6.8	15.3				7/16	15.0	18.5	10/23	-2.5	16.4	4
MW-67-39	3/5	-1.2	12.7	4/17	-2.3	16.1				7/16	6.3	19.8	10/23	-4.1	16.8	0
CSS				4/23	12.5	18.0							11/6	10.0	14.8	11
NCD	2/18	438	36	4/1	441.0	34.2	6/24	135.0	23.9	9/9	189.0	24.2	12/9	328.0	32.7	306
SFDS	2/20	6.3	20.5	4/3	-0.3	16.3	6/26	6.8	20.6	9/11	1.8	16.9	12/11	4.8	17.4	4

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
B-1	times per quarter; no water available for samples															
B-6	1/29	-0.3	1.2	4/10	-0.9	1.2				7/9	1.4	1.9	10/16	1.1	1.8	0.3
I-2	2/6	0.9	1.5	4/24	1.9	1.8				7/31	0.3	1.7	11/4	0.8	1.8	1.0
MH-5	1/30	0.0	1.3	4/11	1.6	1.8				7/12	0.1	1.5	10/24	-0.3	1.6	0.4
MW-107				5/6	1.7	1.9										1.7
MW-111				4/23	1.4	1.8							12/12	0.1	1.2	0.8
MW-30-69	2/21	1.5	1.7	5/2	0.6	1.5				8/30	0.8	1.8	12/4	-0.5	1.3	0.6
MW-30-84	2/21	1.3	1.6	5/2	0.4	1.6				8/30	0.6	1.7	12/4	1.0	1.8	0.8
MW-31-49	2/4	1.2	1.7	4/22	0.4	1.5				7/15	0.7	1.7	10/28	-0.3	1.1	0.5
MW-31-63	2/4	0.6	1.7	4/22	-0.7	1.2				7/15	-0.4	1.2	10/28	0.1	1.0	-0.1
MW-31-85	2/4	0.2	1.4	4/22	0.4	1.6				7/15	-0.6	1.1	10/28	0.0	1.4	0.0
MW-32-149	2/4	1.0	1.5	4/22	-0.1	1.6				7/15	-0.5	1.1	10/28	-0.5	1.0	0.0
MW-32-173	2/4	0.4	1.5	4/22	1.0	1.7				7/15	0.3	1.5	10/28	-0.7	0.8	0.3
MW-32-190	2/4	0.4	1.5	4/22	-0.5	1.6				7/15	0.0	1.7	10/28	0.0	1.2	0.0
MW-32-59	2/4	0.4	1.4	4/22	-0.3	1.7				7/15	1.0	1.5	10/28	-1.0	1.1	0.0
MW-32-85	2/4	0.4	1.5	4/22	-0.8	1.5				7/15	-0.2	1.1	10/28	0.6	1.2	0.0
MW-33				4/23	0.1	1.5										0.1
MW-35				4/23	0.7	1.3										0.7
MW-36-24	2/20	2.1	2.2	5/1	1.0	1.8				7/31	0.6	1.1	11/7	0.6	1.3	1.0
MW-36-41	2/20	6.2	2.0	5/1	5.6	2.3				7/31	3.0	1.9	11/7	2.5	1.7	4.3
MW-36-52	2/20	4.5	2.1	5/1	2.6	2.0				7/31	2.7	1.8	11/7	4.7	2.1	3.6
MW-37-22	2/20	8.8	2.2	5/1	8.5	2.9				7/29	4.6	2.2	11/7	11.2	2.8	8.3
MW-37-32	2/20	12.6	2.8	5/1	8.3	2.8				7/29	13.7	3.2	11/7	16.3	3.1	12.7
MW-37-40	2/20	18.8	3.1	5/1	15.7	3.7				7/29	13.9	3.2	11/7	13.1	2.7	15.4
MW-37-57	2/20	16.8	2.8	5/1	12.8	2.6				7/29	18.8	4.1	11/7	19.2	3.6	16.9
MW-39-102				4/24	0.3	1.5							10/29	2.0	1.9	1.1
MW-39-124				4/24	0.7	1.6							10/29	-1.0	1.3	-0.1
MW-39-183				4/24	0.9	1.5							10/29	-1.0	1.5	-0.1
MW-39-195				4/24	1.7	1.8							10/29	0.2	1.5	0.9
MW-39-67				4/24	1.2	1.8							10/29	0.5	1.7	0.9
MW-39-84				4/24	1.1	1.4							10/29	1.6	1.9	1.3
MW-40-100	3/13	0.2	1.7	5/7	-1.0	1.3				7/26	0.1	1.4	11/11	-0.1	1.0	-0.2
MW-40-127	3/13	1.1	1.7	5/7	1.7	1.9				7/26	0.5	1.7	11/11	-1.0	1.0	0.6

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-40-162	3/13	0.2	1.6	5/7	-1.1	1.5				7/26	-0.8	1.5	11/11	-0.4	0.7	-0.5
MW-40-27	3/13	1.2	1.8	5/7	-1.5	1.6				7/26	0.4	1.6	11/11	-0.4	1.1	-0.1
MW-40-46	3/13	0.7	1.6	5/7	1.6	1.8				7/26	0.6	1.7	11/11	-0.6	1.0	0.6
MW-40-81	3/13	0.8	1.6	5/7	-0.3	1.6				7/26	-0.3	1.4	11/11	-1.0	1.0	-0.2
MW-41-40	2/13	5.9	2.3	4/30	3.8	2.3				7/22	1.3	1.5	10/31	1.7	1.9	3.2
MW-41-63	2/13	5.8	2.3	4/30	5.5	2.4				7/22	4.4	2.0	10/31	2.5	1.5	4.6
MW-42-49	2/12	74.7	7.4	3/11	28.2	4.3	4/29	18.3	3.5	7/18	20.8	3.1	10/30	20.8	4.2	32.6
MW-42-78	2/12	-0.8	1.4	3/11	0.4	1.7	4/29	0.0	1.4	7/18	-0.5	1.1	10/30	-0.2	1.6	-0.2
MW-43-28	2/19	0.3	1.7	4/26	-0.3	1.3				7/19	-0.2	1.5	10/31	-1.0	1.4	-0.3
MW-43-62	2/19	0.6	1.2	4/26	-0.2	1.4				7/24	-0.1	1.4	10/31	-0.8	1.4	-0.1
MW-44-102	2/26	-0.1	1.6	5/3	0.0	1.6				7/22	0.3	1.4	11/5	-0.4	0.9	-0.1
MW-44-66	2/26	0.3	1.7	5/3	-1.0	1.3				7/23	-0.6	1.2	11/5	0.1	1.1	-0.3
MW-45-42	2/13	0.8	1.7	4/30	0.5	1.5				7/23	1.4	1.7	11/5	0.3	1.3	0.8
MW-45-61	2/13	-0.8	1.4	4/30	0.2	1.0				7/22	1.3	1.8	11/5	-0.4	1.0	0.1
MW-46	1/29	1.2	1.8	4/10	-0.1	1.6				7/30	1.6	1.7	11/8	-0.4	0.9	0.6
MW-47-56				4/26	-0.7	0.8										-0.7
MW-47-80				4/26	1.7	1.7										1.7
MW-49-26	1/30	14.8	3.2	4/11	12.9	3.3				7/17	10.9	2.7	10/24	13.4	2.2	13.0
MW-49-42	1/30	14.1	3.1	4/11	10.4	2.6				7/17	13.0	2.9	10/24	13.9	3.1	12.9
MW-49-65	1/30	7.4	2.9	4/11	7.7	2.9				7/17	7.2	2.4	10/24	6.4	2.3	7.2
MW-50-42	2/11	6.5	2.8	4/30	5.4	2.4				7/18	1.1	1.7	10/24	7.8	2.8	5.2
MW-50-66	2/11	14.8	3.8	4/30	18.0	3.9				7/18	19.2	3.2	10/24	23.8	4.0	19.0
MW-51-104	3/15	-0.1	1.6	5/6	1.5	1.6				7/25	1.0	1.6	11/12	1.4	1.8	0.9
MW-51-135	3/15	-0.1	1.7	5/6	0.1	1.7				7/25	0.7	1.2	11/12	0.6	1.3	0.3
MW-51-163	3/15	1.0	1.8	5/6	0.7	1.5				7/25	-0.4	1.1	11/12	-0.3	0.9	0.3
MW-51-189	3/15	0.1	1.7	5/6	0.2	1.6				7/25	-0.4	1.3	11/12	0.5	1.6	0.1
MW-51-40	3/15	-0.5	1.3	5/6	0.0	1.5				7/25	-0.3	1.4	11/12	-1.0	1.1	-0.4
MW-51-79	3/15	0.4	1.7	5/6	1.1	1.8				7/25	-0.7	1.4	11/12	0.3	1.1	0.3
MW-52-11				4/24	-0.6	1.6										-0.6
MW-52-122				4/18	1.6	1.8										1.6
MW-52-162				4/18	0.2	1.6										0.2
MW-52-18				4/18	0.5	1.7										0.5
MW-52-181				4/18	-0.7	1.3										-0.7

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-52-48				4/18	0.5	1.7										0.5
MW-52-64				4/18	1.3	1.8										1.3
MW-53-120	2/12	34.6	4.5	4/29	28.4	5.0				7/18	30.1	4.4	10/30	27.4	4.1	30.1
MW-53-82	2/12	-1.0	1.6	4/29	-0.2	1.3				7/18	0.6	1.4	10/30	0.2	1.6	-0.1
MW-54-123	2/11	2.6	2.0	4/12	0.6	1.5				7/23	1.3	1.7	11/1	0.7	1.8	1.3
MW-54-144	2/11	8.3	2.4	4/12	4.9	2.2				7/23	6.9	2.4	11/1	7.0	2.8	6.8
MW-54-173	2/11	4.8	1.9	4/12	3.8	2.1				7/23	3.1	1.8	11/1	3.3	2.1	3.8
MW-54-190	2/11	12.4	3.2	4/12	13.4	3.4				7/23	11.8	3.3	11/1	11.4	3.3	12.3
MW-54-37	2/11	3.5	1.9	4/12	3.2	1.9				7/23	4.8	2.1	11/1	4.3	2.3	3.9
MW-54-58	2/11	1.4	1.8	4/12	0.4	1.6				7/23	-1.7	1.3	11/1	1.0	1.5	0.3
MW-55-24	2/6	12.9	3.2	4/23	26.0	4.7				7/17	18.1	3.6	12/12	10.5	3.6	16.9
MW-55-35	2/6	11.3	2.9	4/23	20.4	4.0				7/17	20.3	3.8	12/12	12.6	3.3	16.2
MW-55-54	2/6	11.9	3.4	4/23	15.6	3.2				7/17	18.8	3.7	12/12	15.3	3.7	15.4
MW-56-53	3/11	0.1	1.6	4/29	0.3	1.7							11/4	-0.1	0.8	0.1
MW-56-83	3/11	1.2	1.8	4/29	0.5	1.7							11/4	0.2	1.3	0.6
MW-57-11				4/12	34.0	5.1										34.0
MW-57-20				4/12	1.5	1.8										1.5
MW-57-45				4/12	1.6	1.8										1.6
MW-58-26	2/14	1.4	1.9	4/25	0.1	1.0							11/6	-0.2	1.2	0.4
MW-58-65	2/14	-0.3	1.1	4/25	0.8	1.8							11/6	-0.9	1.2	-0.1
MW-60-135	2/7	-0.1	1.1	4/19	-0.7	1.3				7/12	0.0	1.5	10/25	-0.1	1.0	-0.3
MW-60-154	2/7	0.5	1.4	4/19	0.2	1.6				7/12	0.3	1.3	10/25	0.0	1.5	0.2
MW-60-176	2/7	-0.5	1.4	4/19	-0.9	1.4				7/12	0.6	1.3	10/25	-0.8	1.3	-0.4
MW-60-35	2/7	0.2	1.6	4/19	1.5	1.8				7/12	-0.4	0.9	10/25	0.3	1.1	0.4
MW-60-53	2/7	-0.6	1.6	4/19	0.8	1.7				7/12	-0.6	1.3	10/25	0.3	1.6	0.0
MW-60-72	2/7	0.1	1.5	4/19	0.5	1.6				7/12	0.0	1.4	10/25	0.5	1.7	0.3
MW-62-138	2/5	3.0	2.0	4/16	-0.7	1.4				7/11	1.1	1.7	10/22	1.8	1.9	1.3
MW-62-18	2/5	1.1	1.8	4/16	0.0	1.5				7/11	0.1	1.2	10/22	0.4	1.3	0.4
MW-62-182	2/5	-0.1	1.5	4/16	-0.9	1.6				7/11	0.0	1.0	10/22	0.5	1.3	-0.1
MW-62-37	2/5	0.2	1.5	4/16	1.1	1.8				7/11	0.5	1.6	10/22	-0.1	1.4	0.4
MW-62-53	2/5	0.6	1.4	4/16	1.8	1.9				7/11	-0.2	1.3	10/22	0.0	1.5	0.5
MW-62-71	2/5	0.8	1.7	4/16	-1.2	1.5				7/11	0.4	1.7	10/22	-0.2	1.5	0.0
MW-62-92	2/5	-0.1	1.6	4/16	0.7	1.6				7/11	-0.2	1.6	10/22	-0.9	1.4	-0.1

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-63-112	1/31	0.7	1.8	4/15	-0.4	1.6				7/10	0.3	1.6	10/21	0.5	1.7	0.3
MW-63-121	1/31	0.0	1.6	4/15	-1.1	1.4				7/10	0.7	1.7	10/21	-1.2	1.3	-0.4
MW-63-163	1/31	1.5	1.9	4/15	-1.1	1.3				7/10	-0.1	1.4	10/21	-0.4	1.1	0.0
MW-63-174	1/31	0.9	1.5	4/15	0.6	1.5				7/10	-1.0	1.5	10/21	-0.3	1.5	0.1
MW-63-18	1/31	-0.8	1.4	4/15	-0.1	1.6				7/10	1.0	1.8	10/21	-0.2	1.4	0.0
MW-63-34	1/31	-0.4	1.5	4/15	-1.0	1.1				7/10	-1.4	1.4	10/21	-0.4	1.3	-0.8
MW-63-50	1/31	0.2	1.4	4/15	-0.6	1.4				7/10	0.1	1.3	10/21	0.1	1.6	-0.1
MW-63-93	1/31	-0.1	1.7	4/15	0.2	1.6				7/10	-0.2	1.6	10/21	0.7	1.5	0.2
MW-66-21	2/22	0.5	1.7	4/17	0.1	1.5				7/16	1.2	1.8	10/23	0.4	1.6	0.5
MW-66-36	2/22	10.0	2.5	4/17	10.0	3.0				7/16	8.6	2.6	10/23	7.3	3.8	9.0
MW-67-105	3/5	1.5	1.9	4/17	0.3	1.6				7/16	1.6	1.7	10/23	1.8	1.9	1.3
MW-67-173	3/5	-1.2	1.4	4/17	0.0	1.7				7/16	0.7	1.7	10/23	-0.2	1.2	-0.2
MW-67-219	3/5	0.8	1.8	4/17	1.0	1.7				7/16	-0.5	1.2	10/23	-0.6	1.1	0.2
MW-67-276	3/5	0.5	1.7	4/17	0.5	1.5				7/16	-0.5	1.6	10/23	0.1	1.2	0.1
MW-67-323	3/5	-0.9	1.5	4/17	0.1	1.6				7/16	-0.5	1.4	10/23	-0.7	0.9	-0.5
MW-67-340	3/5	0.6	1.7	4/17	0.1	1.6				7/16	1.8	1.9	10/23	0.4	1.2	0.7
MW-67-39	3/5	9.3	2.9	4/17	9.4	2.8				7/16	5.3	2.3	10/23	10.0	2.6	8.5
MW-68-103	3/4	0.7	1.7	4/25	0.3	1.7				7/9	-0.5	1.5				0.2
MW-68-132	3/4	0.6	1.7	4/25	0.7	1.7				7/9	0.6	1.8				0.6
MW-68-19	3/4	1.9	1.9	4/25	1.6	1.9				7/9	1.3	1.8				1.6
MW-68-29	3/4	1.2	1.8	4/25	0.1	1.7				7/9	0.2	1.5				0.5
MW-68-57	3/4	1.9	2.0	4/25	-0.8	1.4				7/9	0.6	1.7				0.6
CSS				4/23	15.1	3.4							11/6	20.2	3.1	17.7
NCD	2/18	55.6	6.4	4/1	80.6	7.8	6/24	48.2	4.4	9/9	65.9	5.6	12/9	35.5	5.0	57.2
SFDS	2/20	1.9	2.0	4/3	5.3	2.0	6/26	6.8	2.8	9/11	7.0	2.7	12/11	6.3	2.4	5.5
U3-4D	2/14	-1.0	1.4	4/26	1.3	1.7				7/19	0.0	1.7	10/16	0.9	1.7	0.3
U3-4S	2/14	0.5	1.4	4/26	-0.4	1.0				7/19	1.8	1.9	10/16	0.9	1.7	0.7
U3-T1	2/19	0.4	1.7	5/8	1.1	1.8				7/19	0.9	1.8	11/6	0.1	1.6	0.6
U3-T2	2/19	0.3	1.6	5/8	-0.4	1.6				7/19	0.8	1.7	11/6	1.1	1.8	0.5

Sr-90 in Ground Water - 2013